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More Indications of Better Days in Oil

Highest production in 1930, week ending Feb. 22, average daily output 2,699,096 bbls. Peak of U. S. production, week ending Aug. 24, 1929, average 2,975,435 bbls.

Stabilized Production and Better Prices Follow Revival of Leasing and Increased Field Work

By James McIntyre

Lowest daily average crude oil production in the United States during 1930 was for week ending Dec. 27 with average output of 2,144,074 bbls.

The taking of potentials in Oklahoma was responsible for a 15,595-bbl. increase in the production of that State in the past week. Kansas production was up 3,390 bbls. per day and the Eastern fields show a considerable increase, due altogether to recent increases in the Bradford and Allegany fields, where production fluctuates according to refinery demand for that grade of crude. Potential tests will continue in Oklahoma for the better part of this month, but the State is not producing its allowable. Texas continues to produce over 1,000,000 bbls. per day, which is greatly in excess of the volume allotted it by the Oil States Advisory Committee, but in all other states the production situation is well in hand. The recent 15-cent increase in the price of crude oil and an upward tendency in the gasoline market have greatly cheered oil producers, who continue to look forward to better times after the long lean period through which they have been passing.

An encouraging feature in connection with the producing end of the industry is the recent awakening of the land departments of the larger companies to the necessity of obtaining leases on desirable properties that have been favorably passed upon by the geological departments. It was not so long ago that oil companies were engaged in a general campaign of reducing lease rentals and even surrendering leases long held for protection. During that period practically no new leases were bought. More recently, while the surrendered acreage was not viewed with any more favor than before, there has been a tendency to secure possession of other and better looking acreage that has been gone over by geophysicists and found to be promising.

Field operations in the United States have shown considerable increase lately in flush fields and in areas where big wells are not expected. In the month of October there was an increase of 221 completed wells in the fields east of California, and at the close of the month there were 16 more operations than at the close of September, indicating a net gain of 237 drilling operations.

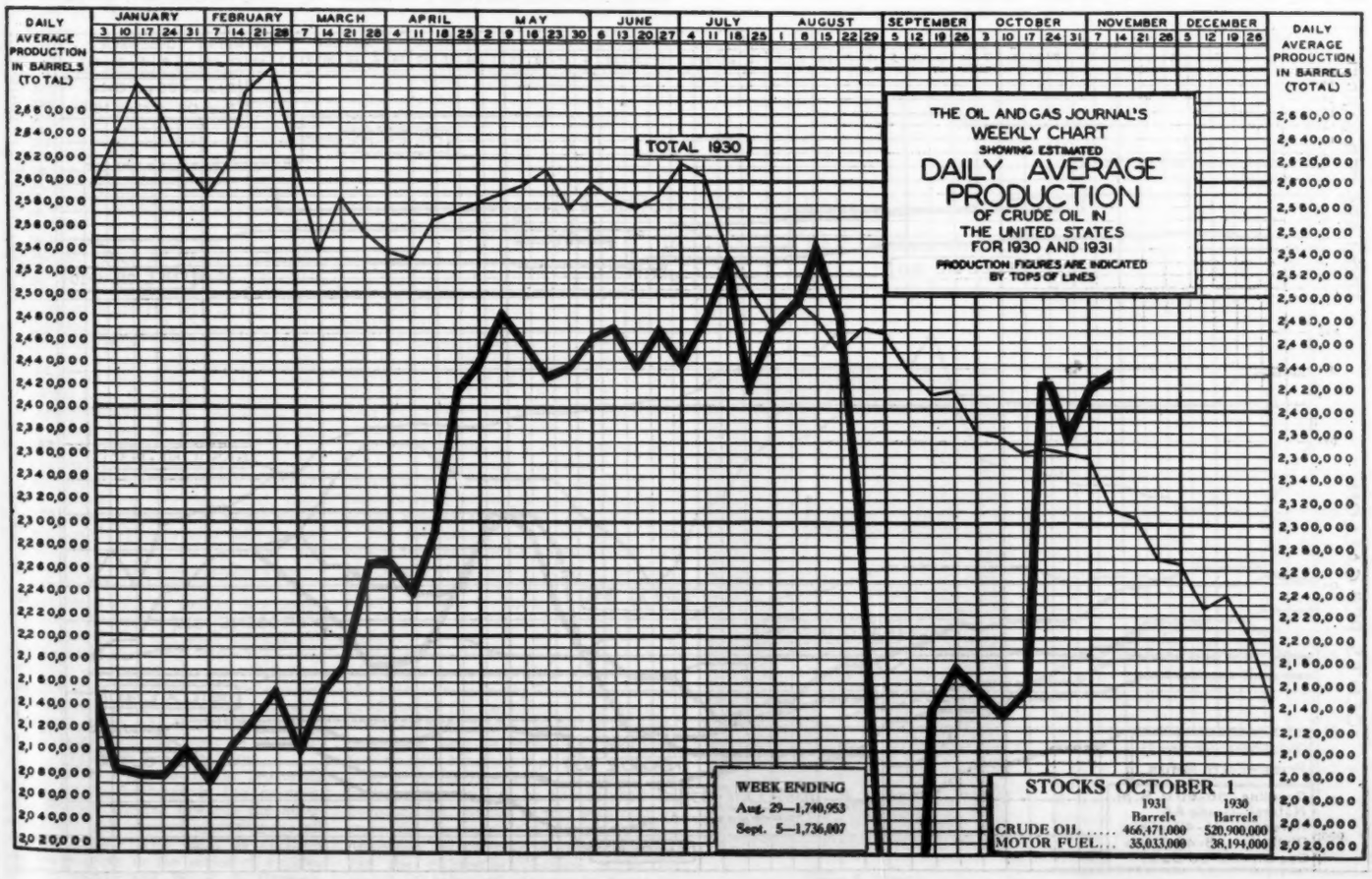
The increase in field operations and revival of leasing preceded the recent increase in oil prices.

PRODUCTION IN THE UNITED STATES

Estimated daily average production of crude oil in the United States for week ended November 7 and a comparison with the previous week follows:

	Nov. 7	Oct. 31
Oklahoma—		
Oklahoma City	189,130	184,815
Seminole-St. Louis	117,665	116,325
Remainder of State	227,415	217,475
Total Oklahoma	534,210	518,615
East Texas—		
Kilgore	148,610	151,515
Lathrop	125,813	122,203
Joiner	144,955	144,011
Total East Texas	419,378	417,729
West Texas	195,257	195,182
North Central Texas	84,297	85,835
Texas Panhandle	67,481	65,037
East Central Texas	55,885	56,435
North Louisiana	29,055	28,890
Arkansas	37,745	37,760
Kansas	106,130	102,740
Total Mid-Continent	1,529,438	1,508,223
Gulf Coast—Texas	120,846	118,722
Gulf Coast—Louisiana	32,455	31,854
Southwest Texas	61,890	59,752
Eastern	122,700	116,900
Rocky Mountain area	93,735	93,867
California—		
Santa Fe Springs	60,350	59,750
Long Beach	74,550	74,000
Playa Del Rey	22,250	22,500
Elwood	24,150	24,250
Kettleman Hills	58,600	58,000
Remainder of State	255,900	255,500
Total California	495,800	494,000
Total United States	2,456,864	2,422,418

→ Increase, 34,446 Bbls. Daily ←



Gasoline Market Continues Advance

Low of 4½ Cents Established for U. S. Motor Grade in Oklahoma. Demand for Furnace Oils Less Active

By C. O. Willson

Refinery gasoline prices in Oklahoma (Group 3) and other Mid-Continent and Middle West refining centers were strong over the past week. The general advance of 1 cent in gasoline tank wagon and service station prices in the middle western states, Oklahoma and Texas, furnished additional impetus for the tank car market and materially aided the operating status of companies that sell the bulk of their gasoline output through their own stations and to jobbers on contracts which are based on the service station schedules. Scattered advances also materialized in several Rocky Mountain and southeastern states.

The U. S. Motor grade of gasoline moved up from a low of 4¼ to 4½ cents in Oklahoma and the higher gravity grades were also slightly higher. It was apparent that trading the first of the week was slower than last week a development which was partially explained by the large representation of the marketing trade in attendance at the annual meeting of the American Petroleum Institute in Chicago. There also was the fact that the contract movement last week was exceptionally heavy. Following the crude oil advances in the Mid-Continent effective November 2 it was assumed that the tank wagon and service station schedules would be advanced and between November 2 and November 6 when the higher retail schedules became effective, jobbers with contracts ordered out maximum shipments of gasoline from their refinery sources of supply. Several refiners were behind in these shipments the first of the week and this situation contributed to the strong spot market.

From the refiners' angle in Oklahoma the 1-cent advance in tank wagon and service station prices means a similar increase in their contract tank car shipments. A number of refiners with well balanced skimming and cracking operations are securing 25 gallons of gasoline for each barrel of crude oil run through their plants; thus the 1 cent extra means an increased revenue of 25 cents per barrel in cases where gasoline is sold on contracts with a guaranteed minimum under the tank wagon or service station schedule regardless of whether it is sold to jobbers or through company owned stations.

This additional revenue was needed to bring the refinery revenue in line with crude oil costs. In fact, a number of refiners were disappointed that the increase in service station prices was not 1.5 or 2 cents instead of 1 cent. It is maintained that another advance upward will be necessary before there is the desired equilibrium between crude oil, refinery gasoline and retail gasoline prices. In this connection, it is pointed out that present service station schedules are still at least 1 cent below those in effect earlier in the year and from 2 to 3 cents below what has been considered normal over the previous two years.

REFINED MARKET BAROMETER

The East Coast area led in gasoline price advances of the past week at refineries with a general increase of one-half cent per gallon. The Mid-Continent and Middle West gasoline market continued to point upward with improvement noted in several other refining areas. The export market also improved. Several of the eastern and California refiners advanced their kerosene quotations and no weakness was reported in this product in any of the refining groups. All grades of fuels were generally unchanged with furnace oil demand improving in the northern states. There was a sharp decline in bright stocks and steam refined stocks at eastern refineries, particularly those made from Pennsylvania Grade crude oils. Natural gasolines were generally firm. Wax unchanged.

Mid-Continent—Upward trend in refinery gasolines continues although spot trading light. Kerosene strong. No change in natural gasolines. Movement of furnace oil material not so active but prices firm. Fair demand for low cold test grades of industrial fuels. Less demand for steam refined stocks and bright stocks.

East Coast—U. S. Motor grade of refinery gasoline advanced one-half cent by larger refiners. Kerosene prices also higher. Prices on cylinder oils lower. Fuel oils firm. Better demand for gas oils. Routine demand for wax.

Pennsylvania—Sharp reduction in several grades of steam refined stocks and bright stocks. Reductions reflect increased output of refineries and lower crude oil prices. Satisfactory demand for gasoline and kerosene and prices firm.

Chicago—Gasoline market active and prices higher. Kerosene prices advanced with increases in several grades of fuel oil, gas oil and furnace oil.

Gulf Coast—Gasoline market stronger. No change in other products.

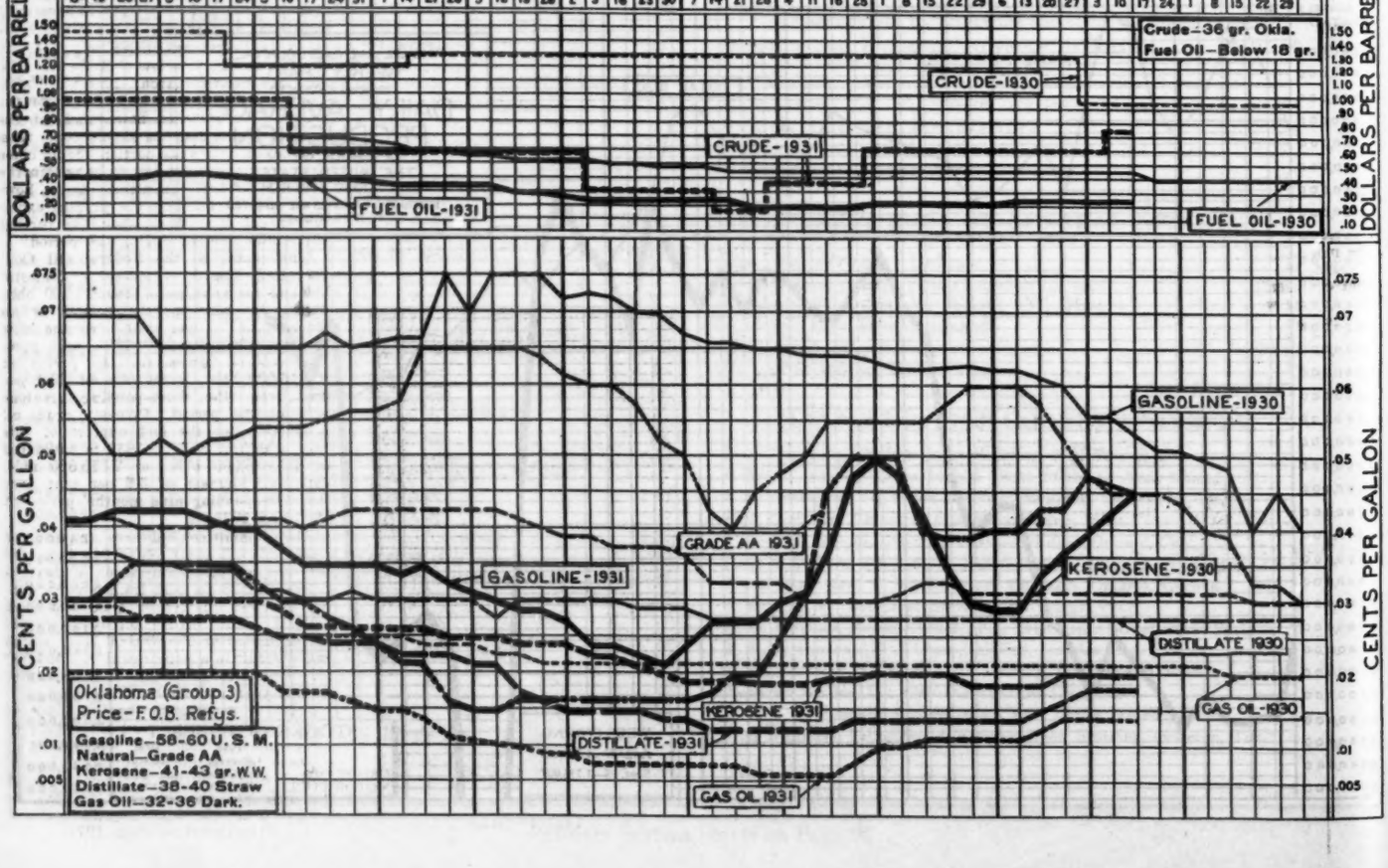
California—Kerosene prices advanced. Gasoline firm.

Other Areas Advance

Some indication that the recent advances in the Mid-Continent gasoline market would receive support from competitive areas was given the first of the week when a one-half cent advance in U. S. Motor prices was announced at refining and bulk terminal points along the Atlantic Seaboard. The Gulf Coast coastwise and export prices were also slightly stronger. Opinions are divided as to what may be expected of the coastal markets over the remainder of the month. It is agreed that an advance in the California crude oil prices similar to that made effective in the Mid-Continent last week is necessary to support any substantial increase in domestic and export prices. This applies not only to gasoline but fuel oil, gas oil and several other products. The attitude of importers of crude oil, gasoline and fuel products is also important in governing the future trend of coastal quotations which will shortly determine the stability of the stronger market at interior points.

Reports from California indicate that the California crude oil prices will be advanced before the end of the month and it is expected that the advance will be immediately reflected in gasoline prices on domestic shipments and also those to the East Coast and foreign buyers. Market observers are inclined to place considerable importance on developments at the annual A.P.I. meeting being held in Chicago this week in their relation to the refinery market over the winter months. This meeting which enables representative leaders in all parts

(Continued on Page 135)



Institute Finds Conditions Are Better

Annual Meeting at Chicago Reflects Improvement in Oil Industry Outlook as Organization Considers Problems

By Andrew M. Rowley

CHICAGO, Nov. 10.—Recognition of the principle of common ownership in an oil pool and the development of plans for combating evasion of payment of gasoline taxes are accomplishments of the twelfth annual convention of the American Petroleum Institute, meeting at the Stevens Hotel here, which, it is believed, will have a substantial and increasingly important influence on the welfare of all branches of the petroleum industry. Progress in the settlement of other problems, each of importance to the various divisions of the oil business, has been so marked during the early sessions of the convention, oil men feel this meeting will stand out as one of the most beneficial for all concerned that the institute has held.

While the convention did not formally open until this afternoon, the numerous committees of the Institute have been holding sessions morning, afternoon and night since last Saturday, more than 50 meetings being scheduled to be held before the convention ends Thursday afternoon. The attendance, while not up to the peak year, is larger than many had expected, many oil men having decided almost at the last minute to be among those present. Increases in the prices of crude oil and gasoline undoubtedly were factors in the making of these decisions.

It is safe to say that men who control probably 95 per cent of the production, refining and transportation facilities of the petroleum industry are here for the convention. About 60 of the 67 directors of the Institute have arrived for the meeting. Completion of the work of the committees on standardization of oil field equipment affected the attendance this year, as there were about 200 members of those committees, and this is the first convention in years that these committees have not met.

An Air of Confidence

Regardless of what decisions are made at this meeting affecting methods of production, refinery practices and policies relating to other problems, the greatest benefit which will accrue to the industry as a whole and to every individual and oil company from this meeting will come from the dissemination of optimism and confidence in the immediate future. The first question asked as one man meets another is, "How do things look?" The answer invariably is the same, "A whole lot better." Confidence in the future is the most important step in the return to prosperity, and the hundreds of informal conferences and discussions being held here this week are strengthening the belief the oil business definitely turned the corner some time ago and steady and constant improvement in conditions can be expected for all branches of the business.

Many representatives and officials of the big supply and equipment manufacturing companies are here and they, sensing these indications of better times, already are planning to meet the expected increase in demand for material and equipment by replenishing depleted stocks in branches throughout the country.

Discussions with oil men in close touch with the situation in every section of the country result in but one conclusion—conditions are distinctly better than they were even one month ago and all indications point to a further and quite material improvement during the spring with conditions which may be characterized as good expected for next year as a whole.

Progress on Unit Plan

Of particular interest to the producing branch of the industry is the progress made at this meeting towards the adoption of the unit plan of operation for all new oil fields. The plan, as outlined comprehensively in the series of articles by Earl Oliver and W. P. Z. German, published by The Oil and Gas Journal in its issues of July 23 to August 27, is the major subject of discussion at the meetings on production at this convention. Indications now are that before the convention adjourns the board of directors of the Institute will adopt a resolution recognizing this principle of common ownership in an oil pool and providing for the appointment of a committee to draw up a comprehensive program for making this principle effective. Such a committee will work out details of the plan and methods through which adoption of the plan will be furthered in the different states, reporting their conclusions to the board of directors at a meeting to be held by the board in the next month or so. Approval of the report of the committee by the board then would start intensive work in the various states to have necessary legislation enacted to make effective and obligatory unit operation of new pools.

Under the plan, each owner of acreage in an oil pool would be entitled to his proportionate share of the recoverable oil and gas from that pool, his share being the percentage of the total that his acreage is to the total acreage of the pool. This proportion of the oil and gas being turned over to him regardless of where wells are drilled in the pool. Such a plan would elimiate waste attendant to hasty and intensive drilling campaigns, permit a far greater recovery of oil from the common pool because of the conservation of the propulsive energy and reduce each landowner's development expense. The plan, by substituting such co-operation and coordination of activities, would tend to stabilize production by eliminating the chaos and waste that ordinarily attend competitive drilling in a new field. It would insure an even and uninterrupted flow of crude and natural gas sufficient to meet market requirements.

Reports by two committees on economics of the industry, showing the estimated crude oil and motor fuel demands during the final quarter of this year and the first half of 1932, were presented to the convention and are receiving careful consideration. The first report was made to Ray Lyman Wilbur, chairman of the Federal Oil Conservation Board, by the voluntary committee on petroleum economics, consisting of E. B. Swanson of the Bureau of Mines, chairman; Martin Van Couvering, Howard Bennette, Alfred G. White and John W. Frey. It was released for consideration of the Institute's convention here. The second report was prepared by a statistical subcommittee for the Institute's committee on refinery statistics and economics and presented to the board of directors of the Institute for consideration.

A.P.I. Committee Estimate

The institute's committee had considered the report of Mr. Swanson's committee. The institute committee's report in part follows:

"It is estimated that the industry may expect a total demand for gasoline during the nine months' period approximating that which prevailed during the corresponding period of the previous year. Domestic demand is expected to increase from 2 to 3 per cent, while present indications are that exports will continue the trend established during previous months and show a further decrease of from 15 to 20 per cent. Coincident, however, with the decline in foreign demand is the prospect of a partially offsetting reduction in the importation of gasoline and the gasoline content in the smaller quantity of crude oil imports.

"Our statistical subcommittee feels that it is economic to continue cracking operations at present levels. This is prompted by the large amount of cracking material available and the desirability of balancing the gas and fuel oil situation as well as that of gasoline."

Consideration of the two reports indicates that required refinery output of gasoline will be approximately that which was produced in the corresponding foregoing period. The 33,330,000 bbls. of gasoline in storage at refineries on October 1, 1931, indicates a surplus of approximately 6,000,000 bbls. above required working stocks required on that date of 27,184,000 bbls. It is, however, apparent that both committees thought it inadvisable to indicate a complete liquidation of this surplus by April 1, 1932, the usual date of peak stocks, due to the very low level of refinery operations required in the period immediately following. For this reason both committees in order to permit of a more uniform rate of refinery production extended the period of liquidation to July 1, 1932, indicating stocks of approximately 43,000,000 bbls. as of April 1, in spite of still being of the opinion that economic stocks of refinery gasoline on that date should approximate 40,000,000 bbls. However, gasoline stocks on April 1, 1932, will be greatly in excess of 43,000,000 bbls. unless the current rate of crude throughput is materially reduced.

Variance in Estimates

The two reports are in substantial agreement in the items of crude run to stills and crude used as such. There is, however, a difference of approximately 19,000,000 bbls. in the demand for domestic crude oil. This is one of the chief points of variance between the two reports, occasioned by a difference in the estimates of imports and exports of crude oil. The voluntary committee on petroleum economics based its estimate on the premise that imports and exports would balance, while the A.P.I. committee attempted to forecast these items.

The net result of the crude oil section of the A.P.I. report is that the demand for domestic crude oil will be 629,300,000 bbls. for the period, or 2,297,000 bbls. per day. This is approximately 159,000 bbls. below the current rate of production. The daily average quantities required by months decline to a low of 2,084,000 bbls. per day during March. This is 213,000 bbls. per day below the average for the period. To indicate how much of the foregoing requirements should come from production and what portion should come from stocks was not felt to be within the province of this committee. It is, however, the opinion that the present excessive stocks of crude oil should be further materially reduced during the period.

The report to the Federal Oil Conservation Board estimates a domestic demand for gasoline of 289,000,000 bbls. during the nine months' period, or an increase of 1.9 per cent over the nine months ending June 30, 1931, with gasoline exports figures for the period at 30,945,000 bbls., a decrease of 19.2 per cent from the corresponding previous nine months' period. Domestic crude oil production for the last quarter of this year and first half of 1932 is estimated at 651,846,000 bbls., or 2,379,000 bbls. daily, an increase of 3.6 per cent over the corresponding nine months' period of 1930 and 1931.

The committee indicates imports of crude oil will total 24,660,000 bbls. for the nine months ending June 30 next, a decrease of 38 per cent from imports during the last quarter of 1930 and first half of 1931. Crude oil requirements are estimated at 678,000,000 bbls., which would result in a withdrawal of 1,494,000 bbls. from storage during the last quarter of this year and first half of next.

From a general business standpoint it is considered significant the report to the government committee anticipates an increase in gasoline consumption in the United States during the remainder of this year and the first half of next, as compared to the nine months starting

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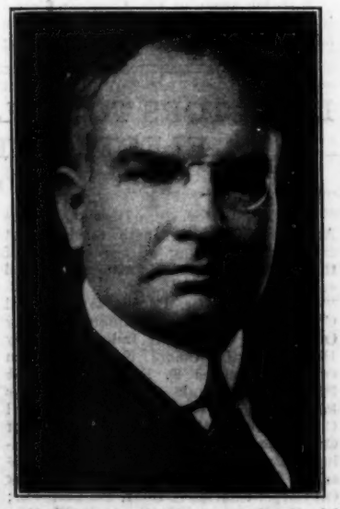
INDICATIONS POINT TO ELECTION OF AMOS L. BEATY TO HEAD A.P.I.

By Andrew M. Rowley

CHICAGO, Nov. 10.—All indications at this time point to the election tomorrow of Amos L. Beaty as president of the American Petroleum Institute to succeed E. B. Reeser, president of the Barnsdall Oil Corp., who held the position for three terms and who steadfastly refused during the convention here even to consider accepting a fourth term. Mr. Beaty is the present treasurer of the Institute and a member of the board of directors and of the executive committee of the Phillips Petroleum Co.

The nominating committee which will select the nominee to be considered by the board of directors at their meeting tomorrow consists of D. J. Moran, W. G. Skelly, William M. Davis, L. P. St. Clair, C. B. Ames, J. Edgar Pew and W. C. Teagle.

Mr. Reeser is wavering in the matter of accepting the position of arbiter of the petroleum industry in California and president of the California Sales Agency, offered him by Pacific Coast oil men. A committee from California has been conferring with Mr. Reeser at the convention here in an effort to have him accept the position, but as yet he has reached no decision. Mr. Reeser is very reluctant to leave the Barnsdall Oil Corp., and this afternoon his attitude in regard to taking the California position might be stated as being 45 chances in favor of acceptance and 55 chances against accepting the offer.



Amos L. Beaty

Plan Campaign Against Tax Racketeers

Marketers Find This Their Biggest Problem, While Refiners Discuss Improved Products to Meet Modern Conditions

By Robert C. Conine
Chicago Bureau, The Oil and Gas Journal

CHICAGO, Nov. 10.—Among the refiners and marketers attending the twelfth annual meeting of the American Petroleum Institute at the Stevens Hotel here, November 10-12, there is little difficulty in ascertaining the two or three problems most widely discussed and of livest interest. For the marketers it is the question: "How is the industry going to combat the evil of gasoline tax evasion successfully?" For the refiner the chief topic for discussion is: "Are the automotive engineers and the refinery technologists going to advance 'side by side,' or are they going to continue a vicious circle in which a slight improvement on the part of one will encourage the other to resume the lead and invite still further improvement?"

The problems which treat with the remedying of the industry's troubles with gasoline tax evaders, and the production of motor fuels which give satisfactory performance in the modern automobile engines under all reasonable conditions, could scarcely be more timely. And from the indications provided in the informal gatherings of the oil men, constructive programs for solving these problems can be worked out among the refiners and marketers themselves, as industrial interests, although the work of crystallizing sentiment or carrying out projects in these connections may be considered outside the province of the American Petroleum Institute.

Fighting Tax Evaders

The view most generally held among the marketers attending the A.P.I. sessions where gasoline tax evasion is discussed favors action along the lines initiated by the Illinois Gasoline Tax Evasion Committee. The members of the Illinois committee set about to form similar groups in other states and later to organize a central committee made up of the chairmen of the state committees.

States in which these committees are now functioning, and, according to all reports, getting results, are Illinois, Indiana, Michigan, Kansas, Missouri, Iowa and Minnesota. States in which this organization work is progressing are: North Dakota, South Dakota, Utah, Wisconsin, Montana, Colorado, Wyoming and Nebraska. The plans of the seven state committees extend only to these 15 states, and the recommendation is made that other regional groupings be made.

Financing the Campaigns

Two views pertaining to the financing of skirmishes against gasoline bootleggers are being discussed particularly. One of these has been suggested by members of the state committees now engaged with the problem, and the other has arisen and gained adherents in the general discussions relating to marketing where the propriety of the institute's official participation was not broached specifically. The suggestion made by several members of the state gasoline tax evasion committees now active proposes that a fund be raised by contributions from the marketing companies, the respective amounts to be determined on a gallonage basis. This fund is to be drawn upon for expenses incurred by the regional chairman, for costs of a legal department, and for the salaries of special investigators sent out by the various state committees. The other plan ties up more closely with the American Petroleum Institute at present and calls for the raising of $100,000 by contributions, likewise based on gallonage, from the oil companies, with this fund to be administered from New York offices. The money will be used, under this plan, to send investigators to help out state and other authorities where means of enforcing the gasoline tax laws are inadequate.

There is no doubt that the oil men are really aroused over the matter of gasoline tax evasion. In all conversations, discussions and institute sessions pertaining to marketing practices the gasoline tax evader is branded a racketeer and embezzler of public funds. The oil men have been brought to realize that this is no petty form of theft which may be considered of negligible importance, but a "racket" in a highly organized and dangerous form which has cut down public revenues by millions of dollars and threatens to demoralize the marketing branch of the industry by the enormous advantage it gives to the unscrupulous dealers who are enabled to undersell legitimate marketers and destroy the honest operator.

It is not expected that the work of organizing the fight against gasoline tax evaders will immediately transmit the zeal of the aroused oil men to the public at large and to the public officials who must co-operate. It is generally understood among the marketers here that a program of education, through service station attendants and through the columns of newspapers, must be launched to make the consumer realize the extent of the damage done by dishonest filling station operators who collect the gasoline tax from the motorist and pockets it for their own use, thus enabling them to offer their product at a price under that of a legitimate dealer. The motorist, it is urged, must learn that he pays more than 4 cents tax on each gallon of gasoline he buys and that unless this money is turned over to the state the highway construction programs that he wants will not be carried out. This, it is pointed out, is of special importance at this time when the unemployment problem could be made easier by extensive road building work.

Various Lines of Attack

Various lines of attack are suggested. Federal authorities may be brought to cope with gasoline tax evasion activities from the angle of income tax evasion, and in the matter of the explosives act, the unscrupulous operators being liable to action on the latter when they ship motor fuel as "distillate," etc. In some states it is proposed to change the status of gasoline tax evasion from a misdeamor to a felony, and in Chicago yesterday pleas of guilty to indictments of gasoline tax evasion brought a warning from the presiding judge that conviction carried a sentence of five years and a fine of $2,000.

Uniform Tax Laws

A strong group at the American Petroleum Institute meeting is urging the adoption of a program intended to bring about uniform tax laws which have teeth in them, and calling for co-operation from the federal Government in preventing interstate traffic in gasoline handled by tax evaders. However the details may be worked out, it is generally agreed that the industry must set about immediately to fight the evil intelligently. It is also agreed that there must be a central organization, either national or regional in scope, which will work through state and local committees, which will in turn take up the problem directly and forcefully with state and local authorities. These committees will enlist the aid of other marketers so that in the end the most indifferent city, county and state administrations will be forced to take action against the law breakers. It has been pointed out that these local and state gasoline tax evasion committees can work with the national or regional committee to bring about changes in ineffectual gasoline tax laws. They can assure the integrity of public officials who are sometimes easy in their dealings. They can gather evidence for the public prosecutor and force him to act, and they can conduct checks of all shipments of gasoline, against receipts reported for tax purposes.

Propose Rewards

The action of one major oil company in offering a reward for information leading to the arrest and conviction of any person or persons attempting to evade the gasoline tax has suggested the carrying out of such a measure as one of the activities of the central gasoline tax evasion committee. From the funds raised by oil company contributions, a portion would be set aside to provide these rewards.

There is some lively discussion as to the proper point, the most effective, to levy the tax. Objections to the various proposals arise almost as promptly as they are mentioned. If the refiner is forced to pay the tax the problem of collection is greatly simplified, but the refiner is often placed at a great disadvantage because he cannot extend credit indefinitely, and must collect the tax when he delivers the material. A refiner on the other side of the state line can give the buyers 20 days or so in which to "pay up." If the service station operator pays the tax to the state directly the problem of collection becomes terrific, and collection of the tax at intermediate points is open to quite as valid objections.

Sounder Marketing Policies

Progress is also to be noted in the work of the state code committees. The various chairmen are reporting a wider interest in the efforts of the institute to bring about sounder marketing policies. The members of these code committees have improved their technique through experience and have found that where opposition is found the remedy lies in giving the hostile marketers a clearer understanding of the code. Where it was thought that the code of marketing practices was a scheme of major interests to harass and drive the small operators out of business a drastic revision of opinion was brought about through a series of weekly meetings at which the purposes of the code were clearly outlined and explained. It was also found to be a sound policy to make the executive secretary of the state's oil men's association the executive secretary of the state code committee.

Antiknock Testing Methods

Refiners attending the meeting are giving particular attention to antiknock testing methods, to processes for raising the octane rating of their gasolines, to treating methods and rerun processes which assure better gum and color stability and good odor. Considerable interest is shown in a practice which is calculated to save lives and property at refineries by preventing blowouts due to corrosion in pressure lines. The pipe is drilled to a certain depth so that when corrosion takes place one or more drill holes, placed at regular intervals, is uncovered and the weak spot is detected.

One of the questions most often heard in connection with knock testing equipment is whether or not the official adoption of the co-operative fuel research engine will call for the junking of all present equipment. It is pointed out that the C.F.R. engine is being constructed so that all of the improvements now foreseen as possible may be made at small cost and little change in the engine proper. It is suggested that the engines now being used be continued in service for routine checking and that instead of replacing parts, etc., the engines themselves be gradually relegated to the junk pile.

Octane Rating

Attention of the refiners is focussed on the present trend toward the marketing of a 70 octane number, or therabouts, gasoline as the regular grade, and the announcement by the Ethyl Gasoline Corp. that on March 1, 1932, the octane rating of the premium gasoline will be raised from 74 octane number to 78. The most important problem, apparently, is the disposition of the straightrun gasoline. Certain refiners are advocating the use of the full capacity of cracking facilities at the refineries and the installation, where needed, of additional pressure stills. Two major refiners contend that the movement is definitely toward the reforming of straightrun gasoline. The straightrun naphtha cut, they say, must be run to the cracking units and the main problem now is to reduce losses due to waste in now condensible gases and in treating.

New Refining Methods

A method for refining gasoline and pressure distillate which represents a wide departure from usual refinery practice is receiving its share of discussion. This process, which involves the passage of the overhead product, in the vapor phase, through a zinc chloride bath or spray in a bubble tower, either between the distillation tower and the condensers or in a separate operation, is said to combine the ability of sulphuric acid to treat all types of raw stock with the low cost, speedy purification which clay catalysis is able to impart to a limited class of pressure distillates. The gasoline so treated, it is said, is practically free from gums and

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DIRECTORS TO FILL EXPIRED TERMS ELECTED AT GENERAL MEETING

By A. M. Rowley

CHICAGO, Nov. 10.—Directors of the American Petroleum Institute elected at the general meeting at the opening of the convention here this afternoon to fill expired terms follow:

W. C. McDuffie, Pacific Western Oil Co.; B. B. Brooks, Consolidated Royalty Oil Co.; H. V. Foster, Indian Territory Illuminating Oil Co.; J. Edgar Pew, Sun Oil Co.; Charles F. Roeser, Roeser & Pendleton; Frank Phillips, Phillips Petroleum Co.; O. D. Donnell, Ohio Oil Co.; R. D. Mathews, Union Oil Co. of California; T. A. Dines, Midwest Refining Co.; P. M. Miskell, Empire Refineries, Inc.; John L. Gray, Deep Rock Oil Corp.; Charles L. Suhr, Pennsoil Co.; W. H. Ferguson, Continental Oil Co.; E. G. Seubert, Standard Oil Co. of Indiana; W. T. Holliday, Standard Oil Co. of Ohio; Lauren J. Drake, Union Tank Car Co.; Floyd C. Brown, Continental Construction Co.; Edgar J. Marston, Texas Pacific Coal & Oil Co.; Herbert L. Pratt, Standard Oil Co. of New York; Richard Airey, Asiatic Petroleum Co.; W. N. Davis, Phillips Petroleum Co.; B. C. Holmes, The Texas Company; F. A. Leovy, Gulf Production Co.; Capt. J. F. Lucey, Lucey Petroleum Co.; E. W. Marland, Ponca City, Okla.; Wallace E. Pratt, Humble Oil & Refining Co.; Frank R. Coates, Henry L. Doherty & Co.; E. B. Reeser, Barnsdall Oil Corp.; H. F. Sinclair, Sinclair Consolidated Oil Corp.; John H. Markham, Jr., Tulsa, and J. W. Van Dyke, Atlantic Refining Co.

Must Avoid Legislative Straightjacket

Secretary of Commerce Lamont Warns Oil Industry Success or Failure of New Movement Will Determine Producers' Future

By Robert P. Lamont
Secretary of Commerce*

During the past five years a new movement has taken form in the oil industry. It is not an exaggeration to say that its success or failure may determine whether the producing branch of the oil industry continues as an individual business, if the new movement succeeds, or comes ultimately under closer federal regulation, if the present effort fails. That movement is the plan for co-operation between the producing states. It may be of service to show the background of that effort, to indicate how far it has gone, and to point out what we hope can be accomplished by it.

Before going back over the last five years, it is well to point out certain present-day conceptions of the relationship of the state and the national governments to the oil industry. First, the national interest deserves emphasis. For, instance, in the matter of national defense: Of 291 seagoing vessels in active service in the Navy, 281 are oil-burners. The Army and Navy between them have about 2,800 planes in commission, all of them using petroleum products. About 80 per cent of the horsepower of all prime movers of the country, fixed and automotive is generated by oil and its products. There are about 26,000,000 automobiles registered or in present use, representing an investment by our citizens of about $18,000,000,000. The 48 consuming states in 1930 collected over $494,000,000 in gasoline sales taxes, quite aside from the crude oil production taxes realized by the producing states. The consuming states collected almost exactly the same amount for each gallon of gasoline —a weighted average of about 3.77 cents—as the oil industry did for all its work from the well through the refinery, since the average refinery price of gasoline was about 3.5 cents.

The 300,000 oil wells which are responsible for the steam of our warships, the flight of our airplanes, the financing of our highways, and the turning of 80 per cent of all our wheels, are most vital factors in the social and economic life of this modern machine age. There is a national interest in the production of oil from these wells which goes to the foundation of the relationship of the Government to the citizen. But these wells are concentrated in a few states; 97 per cent of our production comes from seven states. All but 10 per cent comes from privately owned land. If the supply falters, the nation suffers its lack; if the supply overflows, the nation suffers because its irreplaceable oil and gas are driven into wasteful uses. If gas is wasted either above or below ground, 120,000,000 Americans suffer a three-fold loss; first, because the gas generates no steam; second, because it will never bring oil to the surface; and third, because the oil which is left behind—robbed of its gas content—becomes difficult, if not impossible, to recover.

Movement for Federal Regulation

It is a strange thing that, despite the nation's vital dependence on oil, its production has been almost entirely unaffected by federal regulation. Our present-day conception of the relationship of the federal Government to the landowner, his well, and his lessee is one of remoteness. There is a growing movement for federal regulation of interstate oil and gas movements, but the well itself under our present laws is as remote from federal contact as if it were located in another country. Only in wartime have the two come into a conscious relationship, and then it has been a relationship of collision. This lack of contact between the oil well and the Government may or may not be desirable. I point it out simply to emphasize what follows.

Our seven major oil-producing states bear a peculiar relationship to the nation. If waste occurs, the producing state must prevent it with a power which it is assumed the federal Government does not have—the police power. There is a growing consciousness that the oil states hold their police power in trust for the nation. Any one of four states can directly damage a nationwide industry, impair the tax structure of every state, and indirectly imperil the national defense, by a disregard of this trust. If the trusteeship is wisely administered, there is not likely to be sufficient popular pressure for transfer of the power to the federal Government. If the national interest is selfishly disregarded, and the American people ever become conscious that the mad wastes of the past are being continued, you and I may live to see the oil industry in a legislative straightjacket which it should not deserve.

Five years ago, however, there began this movement of which I spoke, looking toward an exercise of the trusteeship of this oil-producing minority of our states through concerted action among them. In its 1926 report, the Federal Oil Conservation Board outlined a plan for co-operation among the oil states, by compact or otherwise, looking toward uniform laws and correlation in their enforcement. In 1929 the idea was laid by the chairman of the board before a conference called by the President at Colorado Springs, and it was at least informally approved there by the governors of four oil states. In 1930 the board, as an aid to correlation of regional supply to regional demand, began a series of forecasts of demand and recommended supply, which, through either skillful prediction or through their use as guides, have hit within a few per cent of accuracy.

Correlated State Action

The most significant development of this idea of correlated state action has come in 1931, and it is solely because this tendency has gathered force that the oil industry today can face the future with more confidence than at any time in the last five years. In April of this year the Oil States' Advisory Committee, appointed by the governors of 10 states, laid before the Federal Oil Conservation Board a program calling for an agreement among the oil-producing states under which each state, while retaining administration of its own resources, would enact uniform conservation laws, co-ordinate their enforcement with those of other states, and co-operate through an interstate advisory board, which would balance state production quotas and help in the correlation of such quotas with foreign production. The Federal Oil Conservation Board gave its formal approval; such a program was directly in line with its own efforts.

In September of this year the first practical step toward carrying out this program was taken. The Public Service Commission of Kansas, the Oklahoma Corporation Commission, and the Railroad Commission of Texas met jointly and agreed upon a production quota for each oil state which would balance supply against indicated demand. California, New Mexico, Colorado and Wyoming have adhered. A schedule for foreign production was likewise recommended.

Thus, after five years' evolution, we have the beginning of a solution. It is only a beginning. But this evolution has at least brought the industry to the edge of, if not out of the jungle, even if it is still traveling with some difficulty; perhaps if we continue on the same path we may find our way to the open road leading to a satisfactory permanent solution.

I wish therefore to propose to you presently a plan which is not so much an invention as a restatement of ideas that have been soaking in for these five years. Before stating it, I want to point out how far from a permanent solution we still are.

Production Problems

Our production problems fall into two classes—first, stabilization of supply from the various states, and second, the elimination of waste within each state. The stabilization problem includes at least five major items:

First, there is no machinery for scientifically predicting the reasonable market outlet for a state's fields in relation to production from other states. So far, the voluntary efforts of committees of the American Petroleum Institute and of the Federal Oil Conservation Board have been the only guides; these have been available only a short time, and no state is bound to pay any attention to them.

Second, there is no machinery for committing a state to observance of a reasonable production schedule so that its neighbors may plan their own with any assurance. The gentlemen's agreement between Oklahoma, Kansas and Texas now in force shows how important a factor such correlation can be.

Third, there is no federal or state legislation which attempts to regulate the extension of pipe lines into new fields. If there were, much of the unnecessary oil which gluts interstate commerce might be excluded.

International Agreement

Fourth, there is no machinery in existence for correlating domestic production and foreign production, to ensure that domestic curtailment will not be offset by increased foreign production to the detriment of our markets. As long as competing foreign fields are generally unit-operated, and our own are not, any difference in production costs will be borne either by our consumers, if they use American oil, or by the more costly producers if foreign oil replaces their product. Oil once produced will find a market; foreign oil will compete in our market abroad or here. Our best hope, until we put our house in order through unit-operation, lies in international agreements for restriction of production. But the federal government cannot make such an agreement because it lacks the police power to enforce it in any state; and no state may make such an agreement—first, because of the constitutional prohibition against foreign treaties, and second, because if made, the state could not enforce it against its neighbor within our union. A remedy is suggested later in this paper.

Fifth, there are specific federal statutes which prohibit agreement among importers or between importers and domestic interests for the restriction of imports, and prohibit agreements in restraint of interstate commerce.

The above are the difficulties in the way of stabilization, which is our pressing production problem.

Unit Operation

But there are problems of another class; i.e., the prevention of waste within a state, which must ultimately be met. For instance:

First, we have as yet no adequate control over new drilling. Until some state passes a statute which vests in the state the discretion to deny a man the privilege of drilling an oil well which will waste the contents of a common reservoir, and compensates by allowing him to share his neighbor's production and his costs, we are attacking the disease after allowing the infection. If the troubles of this industry had to be summarized in one word, "overdrilling" would be that word. Every state has some provision for licensing of drilling, but most of these state statutes are merely gestures. Minimum spacing of wells, as in California and Texas, and restrictions on production in proportion to the acreage per well, as in Louisiana, are as close as any state statute has come. Some municipalities, such as Oxford, Kans., have successfully gone further. So far only one governmental agency has successfully put a stop to unneeded new drilling—the United States on its own lands, under the conservation order of March 13, 1929, prohibiting issuance of further prospecting permits, and extending existing permits only on deferment of drilling. Second, unit operation is so obviously the one method of adapting the fictitious checkerboard of surface control to the actual unity of the underlying reservoir that the hesitancy to promote it would be inexplicable if we did not know the individualistic background of the industry. So far, no state has attempted compulsion of unit operation; but the possibility is by no means remote. While only three states —California, New Mexico and Wyoming —and the United States on its public lands, have laws specifically authorizing unit operation, the only obstacle to unit operation in other oil-producing states is the possible interference offered by state antitrust laws. However, there is good legal opinion to the effect that agreements for unit development do not violate these state laws.

Market Demand

Third, only one state—Oklahoma—has set up a state regulatory body with specific power to fix a state production quota, based on market demand, and to allocate production as between different fields, and the constitutionality of this power is now before the Supreme Court of the United States. However, even in the event of an adverse decision in the Oklahoma case, there is always the possibility that a similar California statute, drawn at a later date, and now suspended by a referendum petition, embodies important differences from the Oklahoma statute that may lead to its upholding. This statute may then serve as a model for future conservation legislation. Texas has specifically refused her Railroad Commission the authority to take economic waste into consideration, or equate production to market demand. Arkansas and Louisiana prohibit discrimination by a gas purchaser in favor of one field against another. In all other states—Kansas, Texas, Arkansas, Louisiana—where there is a state-directed effort to balance oil production with demand, the statute provides only for proration within a single field and says nothing about balancing the total production of the state against its share of the national demand, nor allocation of production as between competing fields within the state.

Fourth, while eight states have statutes prohibiting the blowing of gas into the air, five states have statutes specifically allowing it, if necessary to operate an oil well.

Fifth, only four states — California, Kansas, Michigan and Texas—have laws prohibiting operation of a well at an excessive gas-oil ratio, or in such a manner as to waste gas energy.

Sixth, only two states—California and Texas—have laws defining as waste the use of production methods which leave

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*Before American Petroleum Institute, Chicago, 1931.

Estimated Gasoline and Crude Demands

Report of Federal Oil Conservation Board Committee for Rest of This Year and First Half of 1932

CHICAGO, Nov. 10.—The report of the Federal Oil Conservation Board's voluntary committee on petroleum economics, says:

Although recent trends in motor fuel demands have been in general accord with the anticipation of the committee, as presented in its report of August 24, 1931, the respective rates of increase in domestic demand and decrease in foreign demand have differed. The committee anticipated an increase of 4 per cent in domestic motor fuel demand during the third quarter of 1931, as compared with the corresponding period of 1930. Actual demand, as reported later by the Bureau of Mines, showed an increase of 2 per cent. With regard to foreign shipments, a decline of about 18 per cent was expected, while the actual decline, reported later, reached 26.6 per cent. When the above estimates were prepared, early in August, it was felt that the domestic demand for motor fuel during the final quarter of 1931 would be more nearly normal, in relation to the early summer period, than later figures have indicated. In the present report, consequently, the previous estimates for domestic and foreign demand during the final quarter of 1931 have been lowered to correspond with the indicated departure from a normal trend.

For the whole of the nine months' period now under consideration (October 1, 1931-June 30, 1932) the committee anticipates a relatively small increase (1.9 per cent) in domestic demand in comparison with the similar period of a year ago and a decline of 19.2 per cent in foreign demand. The provision made for additions to refinery gasoline stocks is considerably less than the actual increase of a year ago. The total motor fuel requirement, consequently, is calculated at 1.6 per cent less than that recorded for the nine months' period ended June 30, 1931.

Foreign Demand

With respect to the probable foreign demand for motor fuel, the committee did not possess data comparable in scope with that related to domestic demand and, consequently, reached the general conclusion that gasoline shipments from the United States to foreign countries and noncontiguous territories would approximate 110,000 bbls. daily. Gasoline shipments from the United States are influenced by the factors related to demand in other countries and by the increasing refining capacity abroad. Beginning with export data for January, 1932, it is expected that natural gasoline shipments will be reported separately, instead of being included with reported shipments of refinery gasoline. This probable change has been taken into account by the committee.

A further curtailment of fuel oil production appears essential to the maintenance of economic stocks. In view of the decline in fuel oil demand and the resulting stock increases, the manufacture from the crude oil of relatively more gasoline and less fuel oil appears to be essential to the maintenance of an economic balance in the oil industry. This may be accomplished through increased "cracking" or by the increased production and utilization of natural gasoline. Increased motor fuel production through "cracking" is possible with present facilities and some increase is anticipated in natural gasoline production, although the peak levels of 1930 are not expected. In the present report, consequently, crude runs at refineries are based upon a projected gasoline output equal to 48.839 per cent of the crude run. This is somewhat higher than the ratio (48.354 per cent) used in the preceding report and is definitely higher than the average ratio (47.854 per cent) reported for the nine months ended June 30, 1931.

SUMMARY TABLE
October 1, 1931-June 30, 1932

	Barrels—Period ended June 30, 1931	Barrels—Period ending June 30, 1932	Change %*
Motor fuel demand:			
Domestic	283,690,000	289,000,000	1.9
Foreign	38,297,000	30,945,000	—19.2
Total demand	321,987,000	319,945,000	— 0.6
Added to storage—			
At refineries	4,871,000	2,690,000	—44.8
Pipe lines, etc.†	1,031,000	.....	...
Total requirement	327,889,000	322,635,000	— 1.6
Motor fuel supply:			
Refinery production	312,069,000	309,200,000	— 0.9
Miscellaneous production	5,124,000	3,800,000	—25.8
Imports	10,696,000	9,635,000	— 9.9
Total supply	327,889,000	322,635,000	— 1.6
Crude oil demand:			
Refinery throughput—			
(a) Domestic crude	614,774,000	608,440,000	— 1.0
(b) Foreign crude	39,468,000	24,660,000	—37.5
Total	654,242,000	633,100,000	— 3.2
Exports	17,124,000	25,600,000	49.5
Used as such, etc.	21,076,000	19,300,000	— 8.4
Total crude oil demand	692,442,000	678,000,000	— 2.1
Crude oil supply:			
Domestic production	639,236,000	‡651,846,000	2.6
Imports	29,764,000	24,660,000	—38.0
Drawn from storage	§23,442,000	1,494,000	—93.6
Total crude oil supply	692,442,000	678,000,000	— 2.1

*Unless indicated by (—), change represents increase. †No provision made for increases in gasoline pipe line storage. Quantities needed to be supplied from gasoline production in addition to that provided for. ‡Total for period at daily rate of 2,379,000 bbls. §Includes all crude except California stocks of heavy crude and fuel oil.

ESTIMATED REFINERY SHIPMENTS, STOCKS AND PRODUCTION OF GASOLINE BY DISTRICTS
October 1, 1931-June 30, 1932
(Figures in thousands of barrels)

Refinery district—	Shipments	Stocks* Oct. 1, 1931	Stocks* June 30, 1932	Change†	Gasoline prod.	Crude throughput	Ratio gasoline to crude %
East Coast	48,000	3,897	4,647	750	48,750	118,900	41.0
Appalachian	11,500	1,394	1,494	100	11,600	23,920	48.5
Indiana, Illinois, Kentucky	45,600	4,684	5,228	544	46,145	75,700	61.0
Oklahoma, Kansas, Missouri	44,600	3,919	3,274	355	44,955	77,600	58.0
Inland Texas	22,315	2,084	1,800	—284	22,030	42,330	51.5
Texas Gulf Coast	52,300	3,547	4,607	1,060	53,560	107,100	50.0
Louisiana Gulf Coast	12,500	626	1,121	495	12,995	28,880	45.0
Northern Louisiana-Arkansas	6,200	244	149	—95	6,105	13,570	45.0
Rocky Mountain	8,750	1,395	1,595	200	8,950	14,200	63.0
California	54,545	12,538	12,103	—435	54,110	130,400	41.5
Total United States	306,510	33,328	36,018	2,690	309,200	633,100	48.839

*Stocks east of California are those held at refineries; California stocks include total inventories of finished gasoline and engine distillate held by California companies within continental United States (stocks at refineries, water terminals and sales distributing stations, including products in transit thereto). †Unless indicated by (—), change shown represents addition to storage.

Crude Required

Although the probable quantity of domestic crude oil, required for the operations outlined, has been indicated, no separate endeavor has been made to determine the proper production levels or the allocation of crude oil production or requirements between producing areas. State organizations, directly concerned with the prevention of waste through production control, have indicated a daily average crude oil production of 2,379,000 bbls. in the United States, during the remainder of the present year and all of 1932.

A daily production of 2,379,000 bbls. would provide a total of 651,846,000 bbls. during the nine months under consideration. This would compare with a total of 629,236,000 bbls. produced during the nine months ended June 30, 1931. In other words, the daily production rate of 2,379,000 bbls. would be approximately 3 per cent higher than the daily average of 2,305,000 bbls. recorded for the preceding period. According to the committee's calculations a program which would consider the stability and continuity of refining operations and the adjustment of supply to probable demand would require a total of 653,340,000 bbls. of domestic crude oil, or a daily average of 2,384,000 bbls. This economic requirement would include the supply of crude oil both from production and through stock withdrawals. If actual operations follow the trend of economic requirements as outlined, the daily production of 2,379,000 bbls. would supply virtually all of the requirement and withdrawals from storage would be negligible.

With regard to crude oil and gasoline imports, the committee based its calculation upon the premise that the quantity of crude oil imported into the United States would equal approximately the quantity shipped out of the country and that gasoline imports during the whole of 1932 would be reduced 25 per cent from 1930 levels.

By the reduction of crude oil imports to a quantity comparable with exports, an average figure of 90,000 bbls. daily would result. For the period under consideration, this would equal a total of 24,660,000 bbls., a reduction of 38 per cent from the total of 39,764,000 bbls. imported during the nine months ended June 30, 1931, in which period crude oil imports averaged 146,000 bbls. daily.

During the first six months of 1930, gasoline imports totaled 8,158,000 bbls., a monthly average of 1,360,000 bbls. For the first six months of 1932, the committee has provided for monthly gasoline imports approximating 1,000,000 bbls., or a reduction of slightly more than 25 per cent from 1930 levels. The monthly average for the whole of the nine months' period is larger than for the first half of 1932, on account of larger imports expected during the final quarter of 1931.

SUMMARY TABLES, BY MONTHS, NINE MONTHS ENDING JUNE 30, 1932
(Figures in thousands of barrels)

Motor fuel:	1931 Oct.	1931 Nov.	1931 Dec.	1932 Jan.	1932 Feb.	1932 Mar.	1932 Apr.	1932 May	1932 June	Nine mos. Oct., '31-June, '32
Domestic demand	33,985	32,005	28,585	27,180	28,055	31,445	33,860	35,710	28,175	289,000
Exports*	3,660	3,600	3,685	3,400	3,200	3,400	3,300	3,400	3,300	30,945
Total demand	37,645	35,605	32,270	30,580	31,255	34,845	37,160	39,110	41,475	319,945
Imports	1,285	1,168	1,182	1,020	960	1,020	990	1,020	990	9,635
Miscellaneous production†	595	630	630	324	313	335	324	335	324	3,800
Net refinery demand	35,765	33,807	30,468	29,236	29,892	33,490	35,846	37,755	40,161	306,510
Refinery production	35,813	34,083	32,366	32,264	31,786	34,628	35,153	36,944	36,163	309,200
Change in stocks	+48	+276	+1,898	+3,028	+1,894	+1,138	—693	—811	—3,998	+2,690
Refinery stocks:										
Beginning	33,328	33,376	33,652	35,550	38,578	40,382	41,520	40,827	40,016	
End	33,376	33,652	35,550	38,578	40,382	41,520	40,827	40,016	36,018	
Crude oil:										
Refinery throughput:										
Domestic crude	70,539	67,086	63,481	63,279	62,474	66,113	69,278	72,857	71,333	608,440
Foreign crude	2,790	2,700	2,790	2,790	2,610	2,790	2,700	2,790	2,700	24,660
Total throughput	73,329	69,786	66,271	66,069	65,084	70,903	71,978	75,647	74,033	633,100
Daily average	2,365	2,326	2,138	2,131	2,244	2,287	2,400	2,440	2,468	2,311
Crude exports	2,900	2,800	2,900	2,900	2,700	2,900	2,800	2,900	2,500	25,600
Used as such	2,200	2,100	2,200	2,200	2,000	2,200	2,100	2,200	2,100	19,300
Total crude requirements	78,429	74,686	71,371	71,169	69,784	76,003	76,878	80,747	78,933	678,000
Foreign	2,790	2,700	2,790	2,790	2,610	2,790	2,700	2,790	2,700	24,660
Domestic	75,639	71,986	68,581	68,379	67,174	73,213	74,178	77,957	76,233	653,340
Daily average domestic crude requirements	2,440	2,400	2,212	2,206	2,316	2,362	2,473	2,515	2,541	2,384

*Exports during October, November and December include unblended natural gasoline. Beginning with January, it is planned to separate such exports from refinery gasoline. †Miscellaneous production, October, November and December includes unblended gasoline included in exports.

Refiners Continue to Curtail Runs

Schedule of Operations for November Considerably Below Two Previous Years. Many Small Plants Remain Idle

By W. T. Ziegenhain

Refiners in the Mid-Continent area will run practically the same volume of crude during November they did during October. However, this month's schedule represents a considerable decrease from that of November a year ago and also that of two years ago. Despite the improved refinery market, those establishing the schedule of operations are attempting to hold production near demand and will regulate the output of gasoline so as not to build up burdensome stocks which would have to be carried over the winter. The recent advance in Mid-Continent crude price has also acted as a stabilizing factor in regard to refinery operations. Distress crude or "cheap" crude which was available in the Oklahoma City and East Texas fields earlier in the year and which was the principal cause for building refineries at these locations is no longer selling below the general posted price. As a result there no longer exists the rush to build additional capacity nor to run as much oil as the present plants could run. As a result, the operations of the balance of the refiners may be adjusted with more certainty and the benefits from a program of orderly planning seem to be more secure. There continues to be a large number of refineries shut down and several plants in the Oklahoma City and in the East Texas area still remain idle despite the opening up of these fields on a rather liberal proration basis.

During November Mid-Continent refiners will average 480,440 bbls. of crude through their stills daily compared with 472,190 bbls. as the schedule for October. This month's runs will be 26,000 under the schedule for November of last year and 65,000 bbls. under the schedule of two years ago. Of the individual areas adding to their crude runs for the month the North Central Texas group of refineries has increased most and Oklahoma ranks second. East Texas has shown a slight increase while the schedules of the Arkansas, Kansas and West Texas groups each show a decrease.

Market Guides Operations

With 38 gravity crude now posted at 81 cents refiners say they need to get 4½ cents for their gasoline even when their plants are balanced for cracking all of the residuum. Under this condition it is difficult for a skimming plant to break even and this accounts for the curtailed operations among many of the smaller plants, especially those not equipped with cracking equipment. Another factor which has newly entered the picture is that of establishing a price differential on gasolines in relation to their antiknock values. A gasoline having an octane number of 60 and above sells for one-quarter to one-half cent more than that of a lower rating. This differential places ordinary straightrun gasoline at 4 to 4½ cents when the cracked gasoline or a blend of cracked and straightrun brings 4½ cents. Aside from the fact there is a pronounced price differential it is also relatively difficult to sell straightrun gasoline of ordinary U. S. Motor specifications unless it is made from a selected crude which yields gasolines of naturally high antiknock value.

In some instances these factors have been augmented by the actual scarcity of crude. Several refiners in Oklahoma have had to curtail their runs because of having overproduced wells in the prorated fields in months past or because they have no supply outside of the Oklahoma City Field. Several refiners in East Texas also have curtailed their operations because of a shortage of crude.

Here, however, other factors are operating also and refiners outside this new area believe the East Texas plants will not prove to be as serious a competitive factor as they were two months ago. Because there no longer is distress crude available and proration of the East Texas Field seems certain for a long time into the future, this group of plants is expected to help maintain the present higher level of refined oil prices.

Then, too, as winter approaches, the problem of disposing of the high cold test fuel oil made from East Texas crude must be considered. Obviously, with a normal crude price these refiners will not be able to "give away" their fuel oil as was suggested when East Texas crude was selling at 15 cents a barrel.

Oklahoma Operations

Oklahoma refiners will add 6,300 bbls. daily to the combined schedule of runs during November. This increase was the result of the Continental Oil Co. returning to a more normal schedule of operations at its Ponca City plant and as a result of resuming operations in several Oklahoma City plants which had been shut down during the nonproductive period of the field while under martial law. Those plants in the Oklahoma City area which resumed operations include the Altitude Petroleum Corp. with a schedule of 1,200 bbls. daily, the Capital City Refining Co. with a schedule of 200 bbls., Century Petroleum Co. at 300 bbls., the Gulf States Oil Corp. at 2,500 bbls. and the York Refining Co. on a schedule of 800 bbls.

Refiners Continue to Curtail Runs

In addition to these plants, a new one has been added to the group of Oklahoma City refineries by the recent completion of the Peerless Refinery and Gasoline Co. This has a capacity of 2,000 bbls. daily and the company expects to add a tower, which will increase its capacity several hundred barrels. It is expected to start running crude within the next week, but the schedule will be indefinite until all of the equipment has been checked.

Only one plant was added to the list of shut down refineries in Oklahoma during October, and that was the Peppers Gasoline Co. 1,000-bbl. plant at Covington. Fire destroyed practically all of the major equipment and it is questionable whether the present plant will be reconditioned.

North-Central Texas

The north-central group of refineries will show the largest increase in the crude runs during November when compared to those of October. This is the result of several plants resuming operations. These include the Wilcox Oil & Gas Co. refinery at Pampa, which was shut down temporarily a month ago, the Waggoner Refining Co. at Electra, the Dale Oil & Refining Co. at Electra and the reconditioned plant of the Sinclair Refining Co. at Fort Worth. To partially counterbalance the effect of these plants starting up, two plants temporarily shut down, namely, the Olney Oil & Refining Co. at Olney and the American Refining Properties at Wichita Falls.

East Texas

Ten thousand barrels refining capacity was added to this area by the recent completion of the Petroleum Refractionating Co. plant at Longview. Although this plant will not start operating immediately, trial runs are planned over the immediate future. This plant brings the total capacity of the East Texas refineries to 78,800 bbls., although only about one-fourth of this capacity is now operating. Three refineries were added to the list of those operating, namely, the Arrow Refining Co. at Overton, the Beacon Oil & Refining Co. at Friars Switch and the Rusk Refining Co. at Overton. Only the Constantin Refining Co. at Overton appears on the list of shut down plants that were in operation a month ago.

The present schedules under which all of the plants are operating is taken as

(Continued on Page 132)

MID-CONTINENT REFINERY OPERATIONS

CRUDE RUNS TO STILLS

	1929	1930	1931
January 1	508,550	535,460	478,795
February 1	506,800	519,355	470,125
March 1	514,950	531,500	449,634
April 1	530,530	555,250	497,394
May 1	577,500	574,300	510,640
June 1	583,030	572,250	567,915
July 1	565,800	548,475	588,840
August 1	555,250	526,400	590,545
September 1	552,300	498,710	588,105
October 1	544,720	518,800	472,190
November 1	545,473	506,700	480,440
December 1	540,630	478,360	.....

OPERATIONS BY DISTRICTS

	—November 1—		Oct. 1	
District—	Daily crude capacity (bbls.)	Daily crude runs (bbls.)	daily crude runs (bbls.)	Nov. daily incr. (bbls.)
Arkansas	47,800	23,400	29,195	*5,795
Kansas	151,500	86,000	88,100	*2,100
North Louisiana	54,300	27,300	26,825	475
Oklahoma	337,300	170,800	164,490	6,310
North Central Texas	212,950	106,990	98,790	8,200
West Texas	148,900	47,060	47,440	*380
East Texas	78,800	18,890	17,350	1,540
Total	1,031,550	480,440	472,190	8,250

*Decrease.

REFINERY OPERATIONS IN OKLAHOMA

(Plants which have been in operation during the past year)

Company and location—	Daily capacity	Runs Nov. 1	Runs Oct. 1
Altitude Petroleum Corp., Oklahoma City	3,000	1,200	(*)
Anderson-Prichard Oil Corp., Cyril	5,000	4,000	4,000
Barnsdall Refineries, Inc., Barnsdall	6,000	4,000	3,750
Barnsdall Refineries, Inc., Okmulgee	10,000	6,000	6,000
Bell Oil & Gas Co., Grandfield	4,500	2,000	2,000
Black Gold Refining Co., Oklahoma City	1,500	800	800
Capital City Refining Co., Oklahoma City	2,500	200	(*)
Century Petroleum Co., Tulsa	500	(*)	(*)
Century Petroleum Co., Oklahoma City	2,500	300	(*)
Champlin Refining Co., Enid	16,000	5,000	5,000
Citizens Refining Co., Seminole	1,000	(*)	(*)
Continental Oil Co., Sapulpa	10,000	1,500	1,500
Continental Oil Co., Ponca City	30,000	14,900	10,150
Cushing Refining & Gasoline Co., Blackwell	1,800	1,500	1,500
Cushing Refining & Gasoline Co., Cushing	3,500	2,500	2,500
Deep Rock Oil Corp. (Shaffer), Cushing	10,000	10,000	10,000
Eason Oil Co., Enid	5,000	2,500	2,500
Empire Oil & Refining Co., Cushing	5,000	(*)	(*)
Empire Oil & Refining Co., Okmulgee	4,000	3,100	3,800
Empire Oil & Refining Co., Ponca City	12,000	5,800	10,000
Garber Refineries, Inc., and Omar Refining Co., Garber	3,500	2,000	2,000
Globe Oil & Refining Co., Blackwell	7,500	6,500	7,000
Gulf States Corp., Oklahoma City	3,500	2,500	(*)
Illinois Oil Co., Cushing	3,000	(*)	(*)
Imperial Refining Co., Ardmore	5,000	(*)	(*)
Johnson Oil Refining Co., Cleveland	6,000	4,800	4,000
McCullough Oil Co., Oklahoma City	2,000	(*)	(*)
Mid-Continent Petroleum Corp., West Tulsa	40,000	18,000	18,000
Marathon Oil Co., Boynton	2,500	1,500	1,500
Marathon Oil Co., Bristow	5,000	3,300	3,500
Morgan Development Co., Tonkawa	3,000	(*)	(*)
Peerless Refinery & Gasoline Co., Oklahoma City	2,000	(*)	(*)
Peppers Gasoline Co., Covington	1,000	(*)	670
Phillips Petroleum Co., Okmulgee	5,000	5,000	3,300
Producers Oil Co., Bristow	2,500	1,200	1,200
Producers & Refiners Corp., West Tulsa	6,000	4,000	4,000
Pure Oil Co., Ardmore	5,000	2,300	2,500
Pure Oil Co., Muskogee	9,000	7,500	7,500
Rock Island Refining Co., Beckett	3,500	3,500	3,000
Sinclair Refining Co. (Pierce), Sand Springs	8,000	2,000	2,000
Sun Oil Co., Yale	5,000	2,000	2,300
Sunray Oil Co. (C. H. Wright, receiver), Allen	7,000	3,500	2,000
The Texas Company, West Tulsa	15,000	13,000	13,000
Texas Pacific Coal & Oil Co., Wynnewood	2,000	(*)	(*)
Tidal Refining Co., Drumright	15,000	10,000	8,000
Western Oil Corp., Beckett	2,000	1,400	1,400
Wewoka Refining Co., Wewoka	2,000	(*)	(*)
White Oak Corp., Allen	8,000	(†)	7,000
Wilcox Oil & Gas Co., Bristow	5,000	3,000	2,000
Wirt Franklin Petroleum Corp., Ardmore	4,000	3,500	3,320
Yale Oil Corp., Yale	2,000	1,000	1,000
York Refining Co., Oklahoma City	3,000	800	(*)
Total	337,300	170,300	164,490

*Shut down. †Cracking only.

Production Trends and Improvements

Summary of Reports Submitted by Members of A.P.I. Topical Committee on Production Practice, Presented at Chicago

By W. W. Scott
Humble Oil & Refining Co.*

The past year has witnessed many interesting trends in the production of oil and gas. The most important factor in this connection is the trend in conservation of oil and gas and its effect on production practices. More consideration has also been given to the fundamental principles governing the recovery of oil than ever before. Substantial progress has been made in recent years, from a conservation viewpoint, through a growing appreciation of the value of gas energy and its proper utilization in efficiently and economically producing oil.

More consideration is being given and more engineering skill is being applied to completing and equipping oil wells than at any time in the history of the industry. The rate of production of oil has been controlled in many areas by proration agreements. This has, in turn, changed many operators' viewpoint on procedure in handling oil wells, and has resulted in the universal practice of producing wells to conserve reservoir gas by flowing through tubing, or by use of bottom hole chokes, surface chokes, restricting the flow to secure low gas-oil ratios, and the general application of back pressure.

A much closer study is now given to the problem of edgewater encroachment than ever before, and some advance has been registered in the methods and controls used to make such encroachment even and uniform throughout the producing formation.

Much progress has been noted in the adoption of methods and procedure for the utilization of reservoir energy in the production of oil and gas. Some of the developments that may give an index of the extent that operators are utilizing the reservoir energy to greater advantage are the use of bottom hole pressure recording instruments; the study of the change in reservoir pressure due to unequal withdrawals and efforts to correct same; the study of gas-oil ratios and flow characteristics of oil wells; the encroachment of water as a factor in pressure maintenance; and the regulation of total field allowable production.

The industry in general has shown much interest in all programs dealing with the maintenance of pressure in flush fields. The underlying purpose of maintenance of reservoir pressure is in the interest of greater ultimate production at a lower cost and yet fulfilling all the requirements of conservation and elimination of waste. Maintenance of pressure properly applied must have its inception in the early life of a field. Observations of production practice in unregulated pools indicate that about 90 per cent of the physical or underground waste occurs during and immediately following the flush stage of production.

In recent years there has been a decided increase in the amount of consideration given to the design and installation of oil and gas separators and vapor systems. This is particularly true of the equipment used in handling the production from high pressure flowing wells.

The development of deeper pay sands in the Santa Fe Springs Field brought about the necessity of pumping wells at a greater depth than ever before. Many wells are successfully pumped at depths from 5,000 to 7,000 feet, and one well has been produced with the pump located 7,801 feet from the surface. The successful pumping of these deep wells has been the result of careful selection and

(Continued on Page 132)

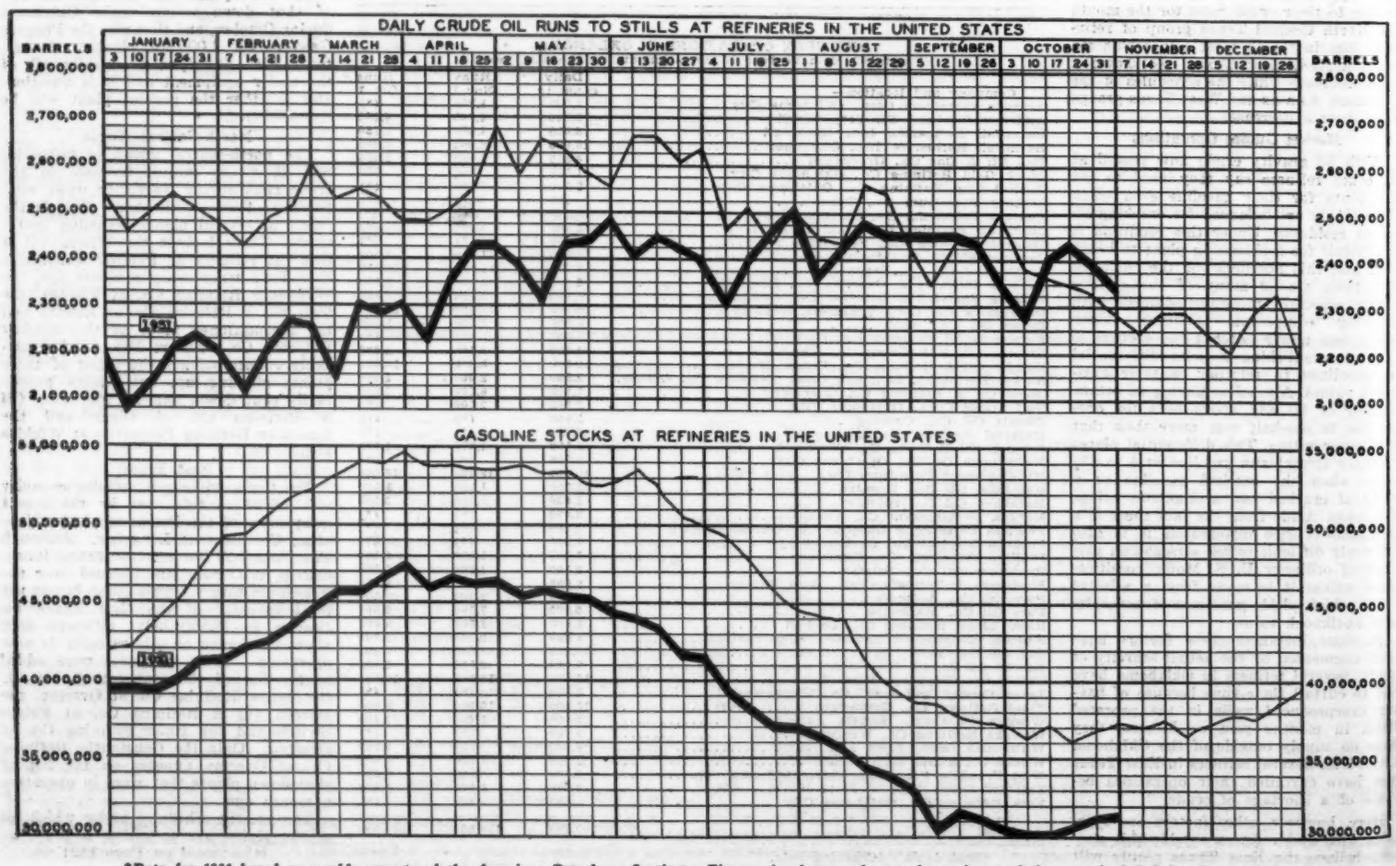
*Before American Petroleum Institute, Chicago, November, 1931.

AMERICAN PETROLEUM INSTITUTE WEEKLY REFINERY STATISTICS

The weekly report made to the American Petroleum Institute on refinery statistics—crude runs to still, gasoline stocks and gas and fuel oil stocks in barrels—for the week ending November 7:

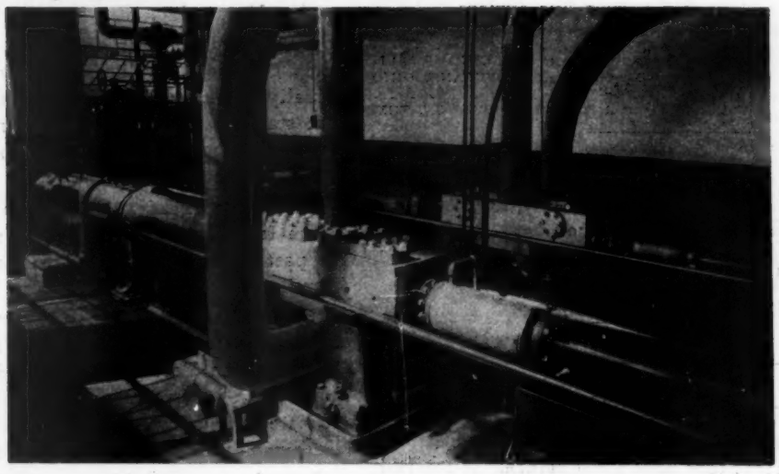
	Week ending November 7, 1931				Week ending October 31				Week ending November 8, 1930			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
East Coast	100.0	467,300	4,116,000	10,378,000	100.0	476,700	3,931,000	10,223,000	100.0	482,000	5,705,000	11,878,000
Appalachian	91.8	85,400	1,319,000	1,668,000	91.8	100,300	1,343,000	1,654,000	93.2	73,400	824,000	990,000
Indiana, Illinois, Kentucky	98.9	302,100	3,183,000	5,647,000	98.9	319,300	3,208,000	5,519,000	97 5	236,900	4,471,000	3,946,000
Oklahoma, Kansas, Missouri	89.6	234,300	2,633,000	4,596,000	89.6	249,600	2,843,000	5,095,000	89 4	248,100	2,215,000	4,577,000
Texas	91.3	549,000	5,810,000	12,026,000	91.3	563,300	5,676,000	11,688,000	91 9	522,300	6,450,000	10,558,000
Louisiana and Arkansas	98.9	160,300	830,000	3,904,000	98.9	140,100	779,000	3,801,000	98 3	148,600	1,217,000	2,062,000
Rocky Mountain	89.4	32,400	1,236,000	814,000	89.4	33,700	1,251,000	826,000	93 1	44,300	1,532,000	1,027,000
California	97.1	463,200	12,944,000	97,717,000	97.1	452,400	12,414,000	96,895,000	98 3	519,000	14,598,000	103,982,000
Total United States	95.2	2,294,000	32,071,000	137,050,000	95.2	2,335,400	31,445,000	135,707,000	95.6	2,274,600	37,012,000	139,020,000
Texas Gulf Coast	99.8	431,000	4,369,000	8,738,000	99.8	441,000	4,380,000	8,362,000	100.0	416,300	5,242,000	7,787,000
Louisiana Gulf Coast	100.0	112,400	719,000	3,059,000	100.0	92,400	665,000	2,938,000	100.0	106,300	991,000	1,105,000

(1) Per cent refinery capacity represented. (2) Daily crude runs to stills. (3) Gasoline stocks. (4) Gas and fuel oil stocks.



*Data for 1931 based on weekly reports of the American Petroleum Institute. Figures for last week not shown in graph but are included in above tables.

SUCCESSFUL REFINERS USE



TRANSIT hot oil PUMPS

Successful refining depends on whether or not you waste or save in your refining operation.

In your cracking plant, for instance, if you are operating a TRANSIT Hot Oil Pump, where the valves are very close to the cylinders, reducing the clearance to a minimum, you have the ideal condition for economical operation. Every stroke puts a cylinder full of oil through the coils.

If, however, you happen to have a pump that has the valves located some distance from the cylinders, making a lot of clearance, then you are operating at a decided disadvantage. Every stroke means that there is a cylinder full of steam used all right, but you are putting through the coils only from 30 to 50% of the fluid cylinder displacement. The result is a big waste of steam.

You will make gasoline, but it will cost you more money to make it than it costs the refiner with a TRANSIT Hot Oil Pump.

If you are contemplating the installation of a cracking process, see to it that a TRANSIT PUMP is specified.

In addition to being an economical unit it is absolutely safe and that means a lot to your big refinery investment.

Literature on request.

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REAL PROGRESS

The twelfth annual meeting of the American Petroleum Institute was worth all the years of effort that have gone before. It marked the realization of more than the founders ever dreamed would be possible, a national organization representing every branch of the oil industry concentrating upon the practical problems of the business, discussing and tackling every issue frankly and fearlessly.

It offers American industry and business an example of a model trade association, collecting and analyzing facts and data necessary for the guidance of operations, assembling and appraising opinions, testing and judging practices, and correlating the economic, engineering and legal aspects of production, manufacturing and marketing policies.

The evolution of the Institute to this stage would not have been possible but for a like evolution in the industry itself. The strongly individualistic cast of the oil industry when the Institute was launched limited the hopes of its sponsors, who had to walk warily to hold the organization together.

The co-operation for national defense in the Petroleum War Board was hardly expected to be continued when the rivalries of peace returned. Yet the actual getting together on that Board and working in harmony for a common cause had laid a foundation of personal contact and mutual understanding which the Institute was designed to perpetuate. It had also shown the possibilities of co-operation in common benefits.

That was the nucleus upon which the co-operative movement of the past eight years was built. Both the Institute and that movement had the same obstacles to overcome—distrust, self-interest and, more than all, the rugged independence of the oil man accustomed to going his own way.

The first step was to convince producers and refiners that their interests, instead of being competitive, were identical; that no branch of the industry could expect to profit permanently at the expense of any other.

Difficult as it was, the task of promoting co-operation would have been vastly more difficult if it had not been supported by developments that compelled attention. The utter failure of the traditional "remedy" of letting overproduction blow its head off left co-operation as the only alternative.

Even then the industry ran up and down any number of blind alleys before it got anywhere. Nor can oil men be blamed for this backing and filling, which is the common mode of human progress.

We see it on every page of history. The political and economic advancement of the race has been a series of zigzags and not a straight line. Reforms never spring full fledged upon the world. They are the outcome of a series of compromises which sometimes take very different lines from any their originators imagined.

It has been so in the evolution of co-operation in the oil industry. Men have been won over to it, a few at a time, by cumulative effects They have been influenced first on one point and then on another until wholly convinced. There has been wide diversity in suggested remedies, but final agreement on essentials.

Unitization, for example, was rejected at Fort Worth, yet it was the keynote of this week's meeting. Interstate compacts were rejected at Colorado Springs, but agreements between the states are in effect today.

Truly the evolution of opinion in the industry has been slow and often contradictory, but as in world and national affairs, it has actually made remarkable progress. Five years ago the statement that stabilization of the oil business depended ultimately upon a world oil program was regarded by some as almost fantastic, yet it is now a practical question.

Naturally this development in the industry has been reflected in the Institute, which has come more and more, especially within the past three years, to take an active part in the discussion and formulation of industry policies.

Besides the code of practices in marketing which it successfully maintained before the Federal Trade Commission, the Institute's Committee on Economics has performed a valuable service for the industry in its estimates of supply and demand, which, with the estimate put out by the Federal Oil Conservation Board Committee, has been a guide to both the producing and manufacturing divisions.

It is just now tackling the gasoline tax evasion racket, which can be combated most effectively by aroused and united industry action. Coupled with that problem is the whole subject of gasoline taxation, which has surely reached the breaking point when the consuming states collect as much in taxes on gasoline as the entire oil industry through the refinery gets for its product.

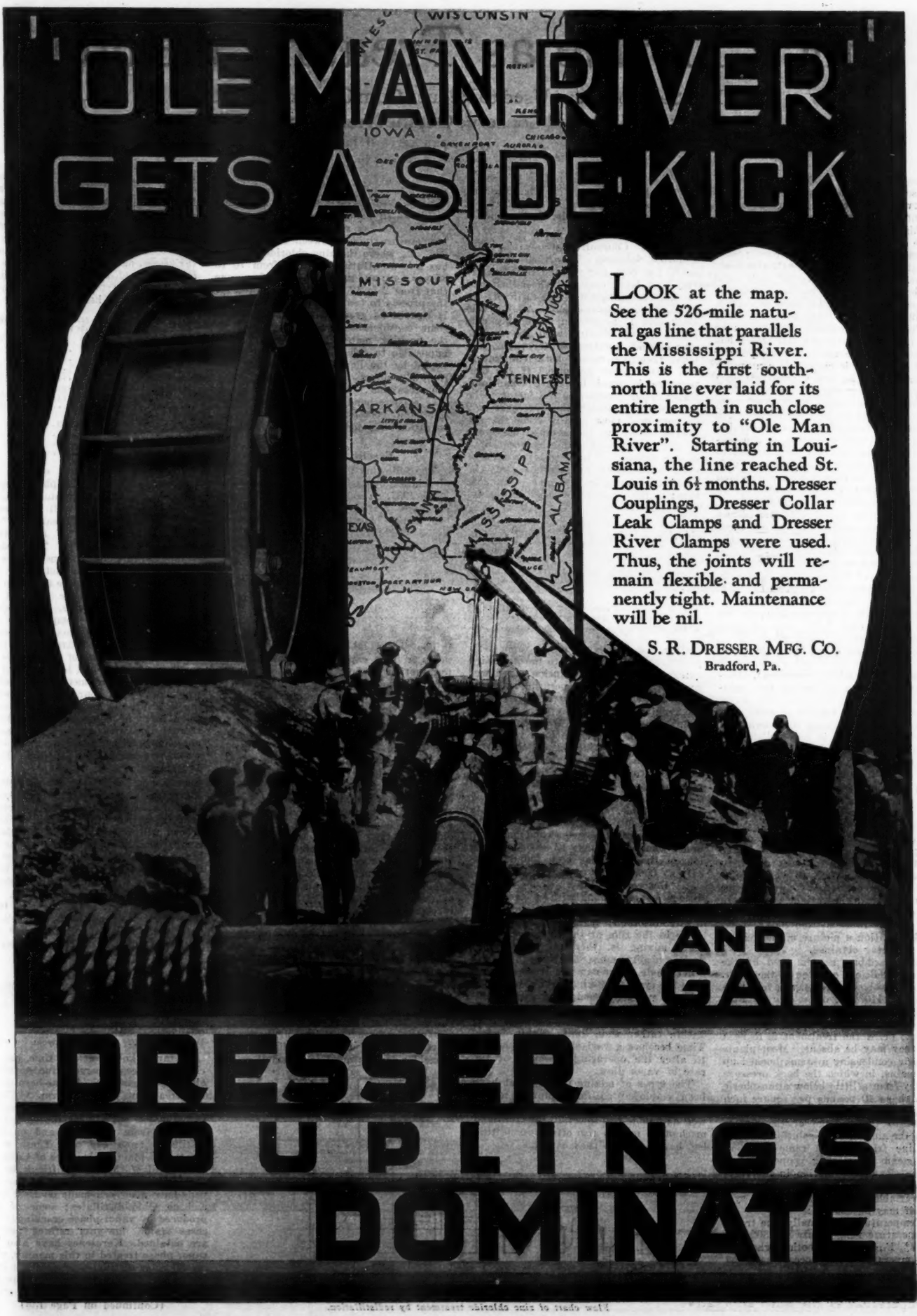
Modification of the antitrust laws, at least in method of application, is another subject engaging the attention, not only of the oil industry, but of the other natural resource industries which find themselves smothering under a mass of overproduction resulting from "free competition." When three oil producing states find it necessary to aid the oil industry in restraining this "free competition" from wasteful overproduction and demoralization, surely Congress cannot much longer ignore the need for bringing the antiquated horse and buggy antitrust laws up to date.

The preservation of the fundamental purpose of these laws, the prevention of oppression of the consumer by monopolistic extortion, can be maintained without forcing competition to run wild.

The producing branch of the oil industry has overcome the fear that co-operation would be considered violation of these archaic statutes, production not being interstate commerce, but the manufacturing branch is still harassed by that intimidation. Recognition of the necessity for keeping the manufacture of petroleum products in line with demand is practically unanimous, but concerted effort to that end is not attempted because of the threat of the law.

Pending some workable amendment that will clarify the application of the statutes, refiners need not wait if they will guide their individual operations in accordance with the chart offered by the reports of the economics committees of the Institute and the Oil Board.

The reports estimating demand and needed supply for the next nine months set a mark which should not be exceeded. The oil industry stands practically alone among the great industries in maintaining its market, but that did not save it last summer in the face of overproduction. That mistake should not be repeated.


'OLE MAN RIVER'
GETS A SIDE-KICK
WISCONSIN
IOWA
MISSOURI
TENNESSEE
ARKANSAS
MISSISSIPPI
ALABAMA
LOUISIANA
TEXAS
LOOK at the map. See the 526-mile natural gas line that parallels the Mississippi River. This is the first south-north line ever laid for its entire length in such close proximity to "Ole Man River". Starting in Louisiana, the line reached St. Louis in 6½ months. Dresser Couplings, Dresser Collar Leak Clamps and Dresser River Clamps were used. Thus, the joints will remain flexible and permanently tight. Maintenance will be nil.
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Zinc Chloride as Treating Reagent

Hot Salt Solutions Used to Reduce Gum Content, Improve Color Stability and Conserve Octane Number of Gasolines

By Arthur Lachman*
University of California, Berkeley, Calif.

A new method of treating gasoline will be described, which in a single operation conserves antiknock quality, reduces gum content to the vanishing point, and confers high color stability.

The new method is a vapor-phase operation. Gasoline vapors are passed through certain boiling metallic salt solutions. A great variety of such salts may be used, viz., the halides, sulphates, nitrates, or other soluble salts of copper, cadmium, mercury, iron, zinc, etc. For practical and economic reasons, zinc chloride is the particular salt which has been chosen for commercial development.[2]

The zinc chloride method is continuous in operation. The raw vapors pass into the treater in a steady stream, where they meet a continuous flow of solution. The treater may be inserted between the fractionating column and its condensing system for "direct" operation, or the condensed raw gasoline may be reheated to the vapor condition in a separate unit supplied with its own condenser. Which method is chosen is largely a question of economics; smaller plants, operating one or two distilling units, will find direct operation more profitable. As the number of such distilling units increases, the cost of a separate reheating unit and condenser is offset by greater economies in the operation of the treating system itself. There seems to be no practical limit to the size of the treating unit. One such unit is now in commercial operation which handles over 5,000 bbls. of gasoline per 24 hours.

Gasoline or any other insoluble vapor or gas (such as the fixed gases which accompany the cracking operation), blowing through a hot or boiling salt solution, will, of course, evaporate the water and finally leave a residue of solid salt. It is essential to prevent this change in concentration, which is accomplished in a simple manner by the continuous addition of water or steam along with the vapors to be treated.

This is not the place to give details of the operation of the treater, since different stocks require different handling, and each stock must be studied to determine the most economic procedure of obtaining the desired results. This is the more necessary since refiners differ in their ideas of the extent to which refining should be carried. It will suffice here to enumerate the variables which are under control or which can be compensated, and to furnish from actual commercial operation a picture of the results which are being obtained.

Certain variables are imposed by the operating conditions existing at the plant. The vapors to be treated may have a temperature of 410° F., or as low as 265° F. Fixed gases may be present to the extent of 750 cubic feet per barrel of distillate; or, if the treatment is to be a rerun, they may be absent. Most plants have their condensing systems hooked up to gas mains, in which the back pressure may vary from a little below atmospheric to as high as 40 pounds per square inch gauge pressure. Some back pressure is also due to the passage of the vapors through the zinc chloride solution, as well as to line friction. In some cracking plants, steam in varying proportions is used to assist dephlegmation in the fractionating towers.

The variables which the treating system itself may adjust are:

1. **Temperature.** Normally, the treating temperature ranges between 302° F. and 347° F., although both higher or lower temperatures may occasionally be advisable. If the vapors to be treated are too low in their initial temperature, heat must be supplied in some manner; most easily, as a rule, by means of superheated steam.

2. **The Concentration of the Zinc Chloride Solution.** This varies from 70 to 85 per cent (by weight) according to the stock being treated. The adjustment of this concentration is not difficult, but requires some calculation. As the concentration is to remain reasonably constant, we are dealing with the system, zinc chloride solution—water vapor, and must, therefore, control both temperature and water vapor pressure. If the temperature is fixed by other conditions, water vapor pressure is the factor to be adjusted. The water vapor pressure may be computed most readily from the following data: a, the average molecular weight of the condensable hydrocarbons; b, the amount of fixed gas per unit of such condensable hydrocarbons; c, the amount of water in a sample of condensate; d, the absolute pressure of the total vapor system.

Since it is possible to supply zinc chloride solution of any desired concentration, too high an original vapor temperature may be reduced to the necessary extent by feeding this solution at a lower concentration than the operating strength, using the excess heat to bring it up to the required point.

3. **Time of Contact Between Vapors and Solution.** Since the total volume of vapors (gasoline, fixed gases, steam) is known from the preceding data, it is a simple matter to compute the volume of treating space required to give the time of contact which preliminary tests show to be desirable. It is interesting to note that this time is measured in seconds. As short a period as two seconds is ample under some conditions; 12 seconds is the longest time that has been found necessary so far.

4. **Degree of Mixing.** Under the conditions of operation, with a gas being washed by a liquid in which it is practically insoluble, action can only take place in the film at the interface. Intimate mixing is, therefore, paramount, and probably more decisive than any other single factor named. However, once a given type of mixing device has been selected and has become, therefore, a constant factor, the operator may vary temperature, concentration, and also time within rather wide limits at his choice. Time becomes a variable if it is possible to alter the operating pressure, or the rate of vapor flow.

The types of mixing devices that have been employed so far comprise towers filled with various sorts of packing, as well as bubble cap towers. Injectors and mechanical mixers also offer possibilities, but have not been used as yet.

To sum up, then, vapor-phase treatment of gasoline with zinc chloride solutions is best accomplished by an equipment which brings about intimate mixture of the gas and liquid phases, at a temperature lying between 302° F. and 347° F., where the zinc chloride solution has a concentration ranging from 70 to 85 per cent, and at such a rate of passage that from 2 to 12 seconds are allowed for the process to complete itself. This time is figured as gross; actually, of course, some considerable space is occupied by the packing material, and it is almost impossible to calculate the net space occupied by the liquid itself; the true period of contact may be less than half the gross time. This rapid reaction permits a correspondingly small equipment; thus, the 5,000-bbl.-per-day unit now in operation has a volume of only 1,100 cubic feet.

Results Accomplished

The following plant figures cover a redistillation operation during the month of June, 1931. The amount of raw pressure distillate treated daily averaged a little over 5,100 bbls., when in full service; for several days this rate was reduced.

OPERATING RESULTS

	Barrels	Barrels	Pct.
Pressure distillate charged	138,135	.....	....
410° F. endpoint gasoline	.....	124,550	90.13
Gas oil	.....	13,323	9.64
Loss	.....	312	0.23
410° F. endpoint content of raw distillate	.....	.....	91.65
410° F. endpoint gasoline produced	.....	.....	90.13
Plant efficiency	.....	.....	98.35

The figure labeled "plant efficiency" needs a little explanation, since the determination of how much gasoline of a given endpoint may be contained in a raw stock of higher endpoint is by no means obvious.

The method of ascertaining the boiling range of gasoline of the American Society for Testing Materials[1] gives comparable results in skilled hands, but the figures so obtained have no real significance in determining yields. If a boiling point curve secured by this method is plotted at 10 per cent intervals, and the content of lower endpoint distillate is scaled off on this curve, we find an actual tank recovery of refined treated gasoline of 103 to 105 per cent, a manifestly absurd result. After many varied trials, it was found that distillation at a moderate rate of a sample of one liter of the raw stock, through a long glass column containing a 30 cm. layer of jack chain up to the same endpoint as given by the A.S.T.M. distillation of the refined stock would yield a distillate having an A.S.T.M. boiling point curve very similar to that of the refined stock itself. The percentage of desired endpoint gasoline ascertained in this manner is regarded as the comparison figure. There is no real assurance of its accuracy. It is clear, however, that the loss of actual gasoline during zinc-chloride treatment is so small as to have little importance. The overall loss of 0.23 per cent is itself probably a trifle high, since no allowance has been made for recoveries in the absorption system.

As the raw distillate under treatment comes from a number of cracking units, the product of which is subject to some variations, daily composite samples of the raw stock and of the treated gasoline are analyzed. A typical set of comparison figures is given here.

COMPARISON OF RAW AND TREATED STOCKS

	Raw	Treated
Gravity, deg. A.P.I.	53.2	55.9
Initial boiling point	99°F.	90°F.
10 per cent point	165	153
50 per cent point	297	280
90 per cent point	395	377
95 per cent point	413	395
Endpoint	437	407
Gum (copper-dish method)	290 mg.	3 mg.
Sulphur, per cent	0.28	0.19
Mercaptans, as molar	0.017	0.007
Color	..	30

Reduction in sulphur content varies with the nature of the sulphur compounds present. The average reduction is from 25 to 40 per cent. It will be noted that the treated stock is still markedly "sour," but that the amount of mercaptans is considerably diminished. The reduction in mercaptan content seems to be a function of the time of contact, other things being equal. It is possible to obtain sweet distillates, but the time required is so great that it is cheaper, in the case of cracked gasolines, to complete the sweetening operation subsequently. When used for the treatment of straightrun vapors, in which the amount of sourness is quite small, a sweet product is secured at once.

With the older methods of refining, which also yield sour products, sweetening is a process requiring great care if color is to be conserved. Zinc-chloride-treated distillates, on the other hand, do not change either color or gum number when sweetened with sodium plumbite and sulphur.

It is not possible to compare directly the octane numbers of the raw and the treated stocks, owing to the reduction of endpoint in the latter, which of its own accord will raise the octane number. A comparison, however, of the octane number of the special distillate made for yield determination, with that of the treated stock, shows the number to be unchanged within the errors of measurement.

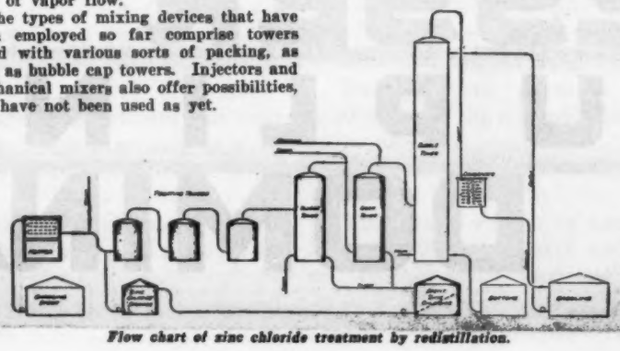
As to color stability, the real test is that of service conditions. The following data are available for a tanker cargo shipped from Los Angeles to Bayonne, through the Panama Canal:

STABILITY RESULTS

	Los Angeles	Bayonne (30 days later)
Color	30	30
Octane No.	68	68
Gum (copper dish), mg.	4	4
Doctor test	sweet	sweet

So far as known at this time, the zinc-chloride process operates successfully on all types of gasolines. It has been used in the treatment of straightrun California gasoline, on Cross cracked distillates from kerosene, gas oil, and residuum, on Dubbs distillate from residuum, and on Black distillates from gas oil. These stocks, treated on plant scale, were of California origin; all of them are difficult to handle by the older methods. Laboratory runs have also been made on East Texas and on Ohio distillates; some of them produced by vapor-phase cracking; in all cases stable, low-gum refined products are obtained. Kerosenes have also been vapor-phase treated in this manner, yielding 30 color distillates of excellent burning qualities, with recoveries of over 99 per cent, and entirely free of what has

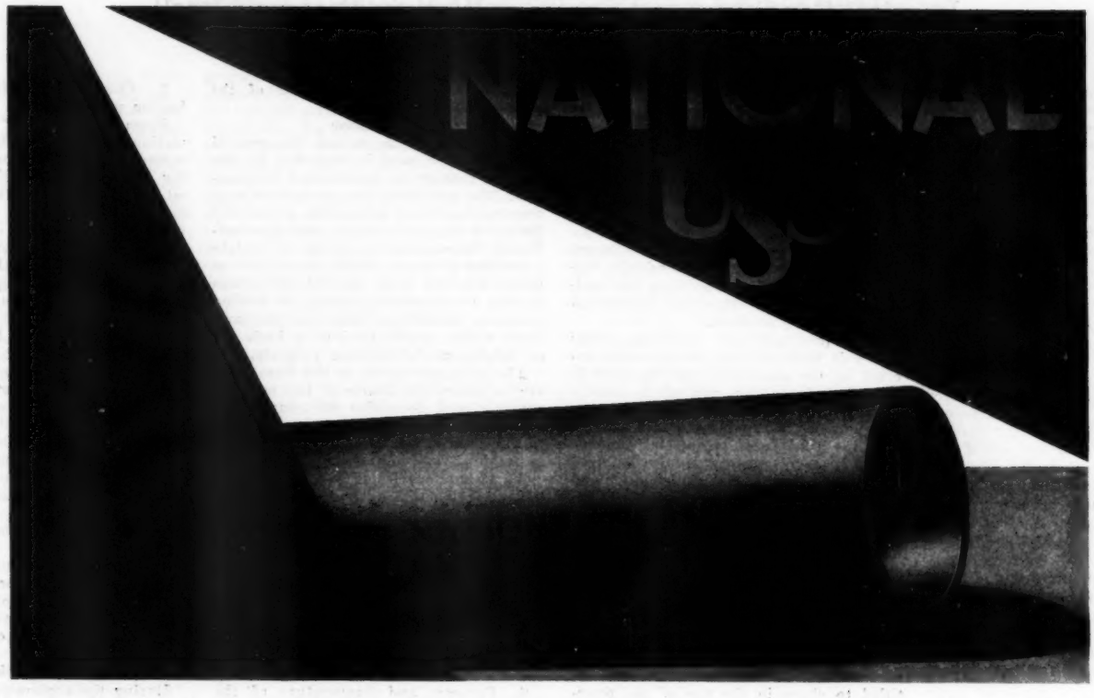
(Continued on Page 133)



Flow chart of zinc chloride treatment by redistillation.

*Annual meeting Chicago, A.P.I. meeting, November 11-12.

[1]Method D86-30, A.P.I.-Standard Method 507-30.



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Tennessee Coal, Iron & R. R. Company
Universal Atlas Cement Company

Pool Development Has Been One-Sided

Evidence Seen That Too Little Consideration Is Given to Physical Conditions and Forces at Work in Reservoir Itself

By John R. Suman
Humble Oil & Refining Co., Houston, Tex.*

During the past few years serious attention has been given to the fundamental principles governing the production of oil. As the study of these principles has progressed, it has become more and more evident, from the point of view of efficient recovery of oil and gas, that customary practice relating to well spacing and rates of withdrawal has dominated oil pool development, and that too little consideration has been given to the physical conditions and the various forces at work in the reservoir itself.

It is the purpose of this paper to enunciate the basic principles under which a reservoir of oil should be exploited and produced, assuming that it is possible to disregard entirely all surface property boundaries and all restrictions imposed by existing laws against co-operative agreements in the production of raw materials. In order that the most advanced scientific principles may be utilized for the maximum economic recovery, and in order to give equity full play, it appears evident that certain parts of the present laws must be revised.

The premises in the application of these fundamental principles are:

1. Oil and gas in a reservoir are mobile, and move underground without regard to property lines on the surface, differing in this respect from other natural minerals.

2. The pool should be produced in the most efficient manner in order to lower costs, increase recovery, and minimize waste.

*Presented at twelfth annual meeting of American Petroleum Institute, Chicago.

3. The oil and gas recovered from a pool should be distributed equitably among the several owners of the pool.

An oil pool, and likewise any portion of the pool covered by a given surface leasehold, contains a determinable volume of oil and gas at all times. The oil and gas are not evenly distributed throughout the pool, and the volume per acre may vary considerably in different parts of the structure. The relative volume of oil and gas underlying the various leaseholds is subject to determination as drilling proceeds.

Each pool possesses reservoir energy which is derived from the pressure exerted by the gas, both that dissolved in the oil and the free gas which usually lies above the oil, and in most cases from the pressure exerted by water moving into the pool from below or from the sides. Reservoir energy is also referred to in such terms as "gas energy" and "energy factor." It is responsible for the movement of the oil to the wells drilled into the pool, and lifts it to the surface during the flowing life of the pool. Reservoir energy is the common property of all owners of the pool, and must be utilized for the greatest good of all. As oil and gas are produced, the various owners in the pool are entitled to share in the production in proportion to the acreage content of their land, and are entitled to share in the use of the reservoir energy in proportion to the acreage which they own. Wells for oil production should be drilled at points where the oil can be withdrawn most efficiently, irrespective of land ownership, and the oil distributed equitably among all owners without regard to the location of the producing wells.

Exploration

Before drilling is started, the general outline of the pool is indicated by the surface geology or geophysical information. The geological or geophysical map may, or may not, accurately define the limits of the pool, but it does give sufficient information on which to initiate a drilling program. Wells are drilled at points selected with the aid of surface geology or geophysical data. As drilling proceeds, subsurface data are accumulated which can be used as a basis for an intelligent development program.

The primary objects of the first wells are to define the limits of the pool accurately, and determine the characteristics of the producing formation. A sufficient number of wells must be drilled to establish the following:

A. **Characteristics of reservoir.**

1. Area, position, and thickness of producing zone.
2. Geologic structure of the producing zone.
3. Porosity, permeability, and degree of oil saturation.
4. Position and area of oil-saturated part and position of gas-saturated part of the reservoir.
5. Position and level of top, edge, and bottom water.
6. Pressure and temperature of the reservoir.
7. Characteristics of oil and gas. (a) Volume of gas dissolved in oil. (b) Gravity, viscosity, etc. (c) Analysis of oil and gas.

B. **Characteristics, underground water.**

1. Chemical analysis of top, edge, and bottom water.

From the first wells sufficient information will be available to determine the correct well-spacing program for securing the maximum ultimate recovery of oil commensurate with accepted standards of efficiency and economy. The position of the various land lines which demarcate surface ownerships should have no bearing on the spacing of the wells. Under the proposed plan, wells will be drilled with a close spacing in parts of the pool, while in other parts the well spacing may be very wide. The rate of development should depend somewhat on the proposed rate of withdrawal. In the initial stages of the development of the pool no pronounced withdrawal should be started until the relative content values are established, and until withdrawals can be made at the most advantageous points in the field.

Should a deeper, or separate, producing horizon be discovered, it should be handled in the same manner as if it were a separate pool, and be produced through separate wells. Precaution must be taken to prevent oil, gas, or water from one horizon escaping into another, except when such transfer may be deliberately made in the interest of efficient operation.

Equitable Distribution of Proceeds

During the exploration of the pool its limits are defined and the characteristics of the oil-bearing formation, and the oil, gas, and water content of the reservoir are determined. A compilation of this information reveals the average thick-

(Continued on Page 103)

Oil Well Supply Co. Moves Headquarters To Dallas February 1

DALLAS, Tex., Nov. 9.—The Oil Well Supply Co., has announced selection of Dallas as its headquarters, and will move February 1 from Pittsburgh, occupying the five-story fireproof building of the Federal Glass & Paint Co. on North Lamar Street at Caruth Street.

Plans have been made for remodeling the Dallas building at a cost of $45,000. The three upper floors will be used for offices of the several hundred employes, and the two lower floors for showrooms and warehouse. J. A. Pitsinger, architect, will supervise the remodeling, for which Cedric Burgher holds the contract.

B. F. Harris, president; D. J. Brown, F. F. Murray and J. M. Shimar, vice presidents; Leon F. Payne, vice president and treasurer; E. W. Criswell, secretary, and W. H. Whittekin, export manager, will move to Dallas. H. J. Morlang, vice president, will also be located in Dallas. Besides these, the company will take to Dallas 200 employes.

MAGNETIC STORM

Tucson, Ariz., observatory of the U. S. Coast and Geodetic Survey reports a moderate magnetic storm starting at 11 p. m. (C.S.T.) on November 7 and ending at 11 p. m. (C.S.T.) on November 8. The telegram quoted below is expressed in terms of Greenwich Civil Time counted from midnight to midnight which will account for the difference in dating between the telegram and the above translation of same.

"Storm began eighth. Five. Moderate. Ended ninth. Five."

Late Fields

CALIFORNIA

LOS ANGELES, Calif., Nov. 9.—The Kettleman Hills North Dome Association brought in the best producer to date in the North Dome of the Kettleman Hills Field early Saturday when its No. 25-28-J came in under perfect control at the rate of 29,760 bbls. of clean 36-gravity oil and 30,000,000 feet of gas daily from a depth of 8,297 feet. This well is located in Section 28-21-17 on the Milham Exploration Co.'s property and is the association's second completion within three days at Kettleman. It was beaned back to 3,740 bbls.

WEST TEXAS

FORT WORTH, Tex., Nov. 10.—Shipley & Byrd's No. 1 Monroe, Section 3, Block 1, W and NW survey, Western Ward County wildcat, is standing with 1,500 feet oil in hole at 4,665 feet and will probably be shot latter part of week.

Southwest Oil Production Co. and Penn Oil Co. No. 1 Tubb, Section 3, Block 27-B, Western Crane County, is looking more encouraging since encoun-

(Continued on Page 135)

GEOLOGISTS' ANNUAL MEETING

The seventeenth annual meeting of the American Association of Petroleum Geologists will be held at Oklahoma City March 24-25-26, 1932. The Biltmore Hotel has been selected as convention headquarters. The Oklahoma City Geological Society is arranging entertainment for the meeting. The Society of Economic Paleontologists and Mineralogists, a technical division of the association, will hold a concurrent meeting.

High Spots in Field News

KANSAS

Prolific wells along Ellsworth arch. Barton and Stafford County wells now on production. New Commission order.

MISSISSIPPI

Although Gulf's completion in Clarke County is not commercial producer, it affords best oil show in the state.

GULF COAST

Deep sand proved in Lockwood Field, Fort Bend County; one of best wells on Gulf Coast for some time. Mykawa abandonment.

NORTH LOUISIANA-ARKANSAS

Three wildcats completed dry in East Texas counties and one in Arkansas. Doubt about connecting Zwolle and Blue Lake Fields.

SOUTHWEST TEXAS

New locations in Southwest Texas areas increase. Considerable activity in Pettus Field. Saxet deep test abandoned.

ROCKY MOUNTAIN AREA

North Colorado monopolizing attention. Fort Morgan test thought to indicate good production. Greasewood well near completion.

EAST TEXAS

Production reduced to 125 bbls. per well daily, fourth cut since martial law. Now 2,803 producers. During week 99 new locations were reported and 149 wells completed.

WEST AND NORTH TEXAS

Western Ward County discovers Delaware sand pool. Fisher County has another good well. Operations increase in Ranger and North Texas.

OKLAHOMA

Gauges indicate potentials at Oklahoma City will show substantial decline. Cado County deep test cleaning out and trying to get on bottom.

CALIFORNIA

North Dome reports best producer yet completed in Kettleman Hills at rate of 29,760 bbls. of clean 36 gravity oil and 30,000,000 feet of gas.

Problems of the Petroleum Industry

President of American Petroleum Institute Points Out Causes of Much of the Trouble Affecting the Oil Business

By E. B. Reeser
President The Barnsdall Corp. and the American Petroleum Institute.*

In my remarks a year ago I said, "The entire world is in the throes of an economic upheaval. The depression is confined to no one country, nor to one single industry."

Many predictions have been made since that time that "the corner has been turned" and that business henceforth would show constant improvement. Needless to say, few, if any, of these predictions have materialized. It is not within my sphere to speculate on the cause of the depression nor to guess the time when normalcy again will prevail. Volumes have been written on the subject and even the stars have been searched for statistical data, so that he who reads may find exactly the reasons and arguments he desires and even may select the exact data upon which the corner was, or will be turned. One fact, however, has definitely been established. We no longer can live within ourselves, either as nations, as industries or as individuals. Despite our much vaunted self-sufficiency we are forced to admit we are cousins under the crash. Economic interdependence is certain and absolute.

Perhaps it is recognition of that fact that has focused so much attention upon the desirability of stabilizing industrial operations; of smoothing out the peaks and hollows that mark booms and depressions on the economic graph. More and more the idea of independence is being pushed into the background. Fewer and fewer are becoming those who profess to enjoy the liberty of normal times, boastfully quaff the heady wine of abnormal prosperity and proclaim themselves ready to take their chances on being able to survive the ensuing slumps. Gradually we are coming to admit that some program for the control of production must be adopted.

Many Programs Offered

The current depression has produced a plethora of such programs. They differ in detail, but all contemplate the stabilizing or rationalizing of industrial operations to the end that such slumps as that which causes our present headache may in the future be only memories. One of the most widely discussed of these schemes, due perhaps to its essential soundness and the prominence of its sponsor, is that suggested by Gerard Swope, president of the General Electric Co.

Briefly, the Swope plan proposes to stabilize production, consumption and employment by establishing in each industry a trade association supervised by some federal agency. The association would control production, outline trade practices, business ethics and methods of standard accounting and cost service, and collect and disseminate information on the voume of business, inventories, standardization of products, prices, etc. Proponents of the Swope plan assert it would put all domestic corporations of a given class on a parity for domestic business, remove the inequalities of different state laws, provide for standard forms for financial reports and place upon organized industry the obligation to co-ordinate producton and consumption. It is admitted that before the plan can be made operative, modification of existing laws is necessary.

It is not my purpose to pass judgment upon the Swope plan. I wish merely to outline what a typically conservative scheme for the stabilizing of business has to offer and to point out that, in effect, the Swope plan already is to a large degree guiding the petroleum industry. The trade association is the American Petroleum Institute. For obvious reasons it has made no effort to control production beyond lending support to the approved policies of proration and unitization and making recommendations and suggestions for improvement of distressful refining and marketing situations. Stabilization of prices is outside the Institute's scope. Remarkable success has attended its efforts to outline trade practices, business ethics and methods of standard accounting. Information on the volume of business and other pertinent data have been collected and disseminated. Standardization has been one of the organization's greatest achievements. As a clearing house for ideas it has been wonderfully efficient. Without any change in existing laws, and quite without violation, the Institute has been able to do for the petroleum industry much that the Swope plan holds to be essential. Here is the agency then, organized and ready; what further use will be made of it rests with the industry.

*Before annual convention, American Petroleum Institute, Chicago.

Individual Influence

The fact that the petroleum industry, already possessing the instrumentality for stabilization, never has achieved any high degree of stabilization, and the equally obvious fact that it has been affected seriously by a business depression it might have experienced only as a spectator, are due less to failure of the instrumentality than to the inherent weakness of any program of control regardless how sound. Under existing law and in the face of forced competitive conditions, well laid plans and soundly economic programs are at the mercy of the individual. In the final analysis, a few untoward factors and a few uncompromising individuals wield an influence so powerful as to deflect group action from its plotted course to the discomfiture of the majority and without great benefit to the minority.

Take the case of the petroleum history in the past year. Domestic consumption of petroleum products has continued, in the face of a slump in general buying, to exceed that of previous years. This was a blessing conferred upon few, if any, other industries. Despite a decline in sales of new automobiles in the United States since 1928, there has been an increase in the consumption of gasoline, the industry's principal money product. A rapidly growing mileage of improved highways has permitted the same number of vehicles to cover greater distances throughout the entire year. There has been a gain in consumption of gasoline by internal combustion motors employed in other fields. Best of all, this increase has demonstrated that the public, regardless of economic conditions, insists upon possessing and operating its motor vehicles, and is convinced that nothing else it can purchase will give so much satisfaction and so great a return upon the expenditure as petroleum products. I think it is entirely safe to assume that the future of our industry, so far as it depends upon the maintenance of demand, is assured,

But the best assurance of continued demand may come to naught insofar as the making of profit, the primary reason for the existence of any industry, is concerned. Profits are weighed in the balance between supply and demand and any unsettlement of that balance upsets profits. Despite the gain in demand, petroleum products have been selling at the lowest price levels in years. More gasoline has been sold, but at prices about one-third of 10 years ago.

Overproduction This Year

More crude oil was produced and more refined products were manufactured during this year than was justified by sound business judgment. The occupation of two large producing areas by military forces was helpful in reducing production and causing substantial withdrawal from the excessive stocks with which the industry is burdened. Perhaps the resort to the military indicates that state governments have been aroused to the cost, waste and folly of overproduction of natural resources. At the same time it represented an interference in business by government that has established a precedent.

No regiments mounted guard at refinery gates, and refiners in the aggregate have disregarded the economic charts prepared for them by the committees of the Federal Oil Conservation Board and the Institute, and have not curtailed their operations in accordance with statistical data. A better than normal summer market was despoiled by competitive skirmishes which delighted a public always interested in "price wars." Retail prices were pushed below the level of costs. The situation was aggravated by the wholesale competition of racketeers and gasoline tax evaders who were keen enough business men to see that there was more money in taxes than in legitimate profits, if any, and prospered accordingly. Fundamentally these difficulties are an outcome of failure, lack of willingness or definite refusal to support attempts to balance supply and demand.

We have heard a great deal recently, especially from bankers and economists, concerning the "unalterable law of supply and demand" and the utter futility of trying to amend it. The president of the New York Stock Exchange recently stated:

"The law of supply and demand cannot be disregarded and it may not be tampered with. It remains for us to heed the principle of supply and demand, to govern our actions in accordance with its dictates, and thereby, to hasten the restoration of prosperity based on the sound and lasting foundation of natural law.

"Everyone must pull his own weight in the boat. There should be no favored classes or privileged industries. Human power and human vanity may tamper with, but can never circumvent its operation. Being a principle of life itself, it is stronger than any business policy ever formulated. It will have its own way and take its own course. Those who obey it will be rewarded. Those who in folly oppose it will be miserably crushed."

Proration Balances Supply

Inasmuch as hundreds of thousands of our citizens are stockholders in the many oil companies whose stocks are listed on the New York Stock Exchange, it seems proper that an effort be made to correct any impression that the petroleum industry, in its attempts to achieve stability, is seeking either to alter, tamper with or violate this economic law. If the author of the statement just read had this industry's proration policies in mind, let me explain that proration represents earnest endeavor to observe rather than violate that statute, to enforce rather than to tamper with it and to supplement rather than to supplant it. Proration, in its essentials, is a method of balancing the supply of material with a demand for it.

Restriction schemes failed in the cases of coffee, rubber, wheat and other commodities because they were outright efforts to peg prices. I submit there is no analogy between those cases and that of petroleum. We are dealing here with an irreplaceable rather than a crop product. We are interested as much in preventing unnecessary physical waste as in stopping financial losses. We have at heart the future welfare of a nation dependent upon petroleum, not merely the present success of an industry. We are seeking not to elevate and peg prices at high levels, but to avoid both those that are artificially high and those that are artificially low. We are asking that petroleum products bring in the market, at least, a price sufficient to pay the cost of production and consistent with their actual value; that the industry's workers obtain rewards worthy of their hire; and that this country be assured of as plentiful a supply of oil tomorrow as today. I contend that in the case of petroleum, proper balancing of supply and demand and complete observance of the laws governing both, make equitable proration of production between the various fields and states not only desirable and possible, but an absolute necessity.

Let me go somewhat into detail concerning conditions which I believe justify this contention, remembering that what may be said regarding production of crude oil in the field, applies with few variations to operations in the refinery and in the market.

Costs of Drilling

Since the Drake well was completed in 1859, more than 800,000 wells have been drilled in this country. Of these, approximately 470,000 permanently have been abandoned. Of the roundly 330,000 producing oil wells left, 250,000 have an output of less than 5 bbls. each per day. There are perhaps 50,000 additional wells which produce between 5 and 10 bbls. each daily, leaving some 30,000 prolific new wells to supply the bulk of a growing demand.

We drill on an average 24,195 wells annually at a cost of around $600,000,000, not including the expenditures for leases, pipe lines, equipment, storage facilities, etc. Some 2,400 of these are gas wells and 6,500 are dry holes productive of nothing but expense. Many of these new wells have large initial production, but on the average, within 18 months they fall into the 10-bbl. per day class.

Production from newly drilled wells with large initial output flowing freely, naturally costs far less than that from the older and smaller wells, which must be encouraged at some expense to yield their oil. Thus in 1930 the initial production was approximately 10,000,000 bbls., or about 855 bbls. per well per day, a new high record. Any policy which permits such an unrestrained flow from large new wells unquestionably tends to depress prices to levels which force the abandonment of the smaller wells.

It is unreasonable to expect that the phenomenal success we have had in the past few years in finding and developing enormously prolific new producing areas can continue indefinitey. Each year we write off the book of known petroleum resources just so many more areas which either have yielded their supply of oil or proved themselves barren. The producing acreage definitely is limited and, unlike that supplying crop products, cannot be increased. It is only a matter of time until the small wells will be needed to aid in meeting demand. Yet we are jeopardizing not only the productivity of these small wells by forcing their abandonment through cheap production from flush wells, but also the tremendous oil reserves which some time may be required for the preservation of the nation itself.

If the same interests owned relatively the same proportion of large and small wells, production from large wells voluntarily could be curtailed to a point which would insure the productive life of the equally important smaller producers. But our system of ownership admits of no such plan, just as our system of leasing permits of no delay in development of new areas. Each new oil field brings into the industry a group of producers not previously engaged in the oil busi-

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Legal Aspects of Unitized Operations

Legislatures Have Power to Provide for Coequal Rights of Surface Owners Regarding Oil and Gas in Common Pool

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However much we would like to have it otherwise, there are important legal aspects of the new conception of oil production. The new conception is that each producer in a pool is entitled to an opportunity to receive directly or indirectly and to enjoy a fair and equitable share of the recoverable oil and gas from the pool in which his land is located, and that he is entitled to have the pool so efficiently operated as to result in a maximum recovery at a minimum cost.

The impression that this new conception has legal aspects has undoubtedly grown out of the fact that in the earlier stages of the development and operation of some of our oil pools many producers have given no heed to implorations and entreaties that there be a cessation of wild and disordered complete disregard of all conservation principles and practices and that there be a discontinuance of the flagrant disregard of reciprocal and mutual relations and rights between producers, and the fact that the efforts of many producers and of several state administrative agencies to enforce what we call proration have encountered some earnest attacks in the courts of California, Texas and Oklahoma.

As a result of the conditions which obtain, the new conception has become quite firmly grounded and the appreciation that it has certain important legal aspects is equally deep-seated.

Voluntary Co-operation

Since so many desire to adopt the new conception, we ask ourselves the question, Why should it be regarded as legally wrong for producers in a pool voluntarily to co-operate in carrying it out? The primary purposes in view in such a voluntary co-operative movement would be to dispense with injury and waste and to award to each producer in a pool an equal opportunity to obtain his fair and equitable proportionate part of the recoverable oil and gas. If voluntarily done, it would be carried into execution in the same way in which it can be compelled by law. There would be such development and operation on the part of each producer, concurrently with a like development and operation on the part of all other owners in the pool, as would gain the ends above mentioned, or the identical results could be attained by a like operation of groups of pooled acreage or the pooling of the entire field. We are not unmindful of the fact that in some of the states there are conservation statutes which have as a primary feature the protection of the coequal and correlative rights of the several producers in pools where the full potential production of all the wells cannot be had except under conditions constituting waste. We know that up to date the courts have sustained the constitutional validity of these laws. The courts have held them to be police regulations prescribed by legislative enactment, and designed to control human conduct in such a way as to prevent the commission of waste, and to gain in some measure, though by no means perfectly, the end in view contained in the new conception. And so we ask ourselves the question, Why is it that if it be proper for the legislature of a state in the exercise of its police power to require producers to demean themselves in such manner as to gain two laudable ends, how can it be regarded as legally wrong if the producers without such a law voluntarily demean themselves as to accomplish the like ends?

The Human Element

Whatever the answer to these speculations may be, it certainly behooves us to be practical. First, there is a fear, whether well-grounded or not, on the part of some that concerted action in carrying out the new conception would result in accusations that forbidden monopolistic arrangements had been entered into. And, second, it is certain that unanimity of action on the part of all producers cannot be had. In view of this second practical consideration, the first one may be immaterial. Let us postpone till later a consideration of the factor of fear of a violation of the antitrust laws, and deal at the moment with the human element which in the very nature of things confronts us, and with its legal aspects.

We are faced with a condition and not a theory. We cannot change the peculiar natural characteristics of oil and gas deposits. We cannot reconstruct subsurface conditions by building partition walls in the resorvoir along property lines. If we could do that and should do so, we would at the same time destroy in large part the great value of reservoir energy in the recovery of the oil. Nor can we hope to eradicate the natural craving of man to gain an advantage over his fellowbeing when opportunity presents itself, especially since it is stimulated as it is by certain rules of property. If we dispensed with it among our brothers of today we would have a host of the unconverted among us tomorrow. Our recent experience in the East Texas Field has demonstrated beyond doubt that no reliance can be placed upon a hope that an educational campaign is the remedy. It takes time and experience to educate a people, and oil producers are no exception to the rule. The East Texas producers, after their almost complete self-destruction by pouncing each upon the other, at last became convinced of the error of their way. Is it fair or sensible that oil producers or the public should have a repetition of those experiences? In a greater or less degree, unless prevented in advance, conditions which obtained in East Texas will be repeated in other fields as time goes on, just as it has occurred in many fields in times gone by. Prevention is always the best cure. The courts have held that before the event occurs it is within the power of our legislative bodies to provide against its happening. (Walls v. Midland Carbon Co., 254 U.S. 300, 65 L.ed. 276.)

Records of Other Pools

We have recorded history of the conditions which obtained in the Glenn Pool in 1909, the Healdton Pool in 1913, and the Cushing Pool in 1914, all in Oklahome prior to the year 1915, in which year the Oklahoma Oil Conservation Statute was enacted. There is no need to recount here the facts disclosed by those records. They are found in several orders of the Oklahoma Corporation Commission issued in 1914 and 1915, and many of those here present have a personal knowledge of them. Most shocking conditions of waste and injury are there described. Suffice it to say that hundreds of thousands of barrels of oil were placed in earthen storage by those forced to produce for their protection, large quantities of which seeped into the ground and were washed down the streams. These were not wild exaggerated statements. Correlative rights were utterly ignored, all because specially equipped producers chose to exercise their legal right to capture all they could through wells on their own lands. Many of the less fortunate chose not to see what they regarded as their own oil appropriated by the more favored, and hence they ran theirs to earthen storage. There may not be a written record of Spindletop or Smackover, but conditions in those fields were equally serious. Human nature is not changing and repetitions of these conditions seem to be avoidable only by an extension of the restraining hand of the law.

There is a legal aspect to this human element. It is the settled law in all of the oil-producing states that in the absence of restraint imposed by an act of the legislature, an owner of land has the legal right to drill wells upon his land into the oil and gas reservoir beneath its surface, and to produce through his wells and capture all of the oil and gas he may choose, regardless of the fact that in doing so he may drain ever so much of the like substance from the lands of his neighbors. His neighbors cannot make him respond in damages for having drained their lands; nor can they obtain an injunction to restrain him from committing further drainage. The only remedy the neighbor has, so the courts hold, is to proceed with equal diligence to drill upon his lands and to produce with equal rapidity through his wells. Some courts hold that a landowner owns the oil and gas in place beneath his lands, while others hold that he owns only the right to reduce what he can to possession on the surface of his land. For our purposes it makes no difference which of the two views is correct, for both sets of courts give to the landowner the right to drain oil and gas from his neighbor and to exhaust, if he can, the reservoir content through his own wells. No good purpose would be served in delving into the reasoning adopted by the courts in coming to these conclusions, because, even if we should satisfy our minds that they are wrong, still we would find that the decisions remain and are of such long standing as to constitute established rules of property. Therefore it would be vain to hope for any immediate change therein.

Old Legal Decisions

These decisions date back considerably more than half a century and they are multitudinous. The problems involved were difficult of solution, and what right have we to say they were not correctly solved? Whether so or not, let us assume that they were and do so with good grace. Students of the subject have recently been wondering why it is that the courts deciding those cases failed from the beginning to apply the ancient common law maxim that no man may so use his own property as unreasonably to injure his neighbors. But when we pause to think about it, we see that if they had done so, still it would have been necessary for some regulatory body to have stepped in and adjusted rights and defined conduct. So, after all, some degree of governmental supervision would have been necessary. But this much is inescapable, namely, that a rule of law which says, as this one does, that a landowner may produce freely and without restraint through wells drilled upon his land, and that he owns all of the oil and gas which he extracts and saves regardless of the amount which he may drain from beneath the lands of his neighbors; and a rule of law which says, as this one does, that the remedy of his neighbors, if they would protect themselves, is to pursue upon their lands a like course of conduct, is a rule which encourages and approves hasty and disordered development and operation of any pool and the commission of immeasurable wastes and the partial, and in some cases complete, destruction of coequal and correlative rights. It is solely because of the existence of this rule to which the courts have tenaciously adhered that the shocking conditions which obtained in Spindletop, Glenn Pool, Healdton, Cushing, Smackover and East Texas and other fields in California and elsewhere too numerous to mention, were brought about. The human element stood upon its legal rights. However convinced we may be that this rule results in an unjust appropriation by some of the oil and gas of others, denominated by some as "legalized piracy," and however convinced we may be that the existence of this rule has stood between us and the prevention or removal of a chaotic state of affairs, still it is the rule, and that fact must be fairly faced.

Legislatures Have Power

Since we cannot reconstruct underground conditions, nor change the peculiar characteristics of oil and gas deposits, nor hope to eradicate the human element, then what remains to be done? What can we do to remedy the evil consequences flowing from these rules of law?

The answer is to be found in but one place, as I view it. It is in the existence of another and equally well-established rule of law. This other rule is this, namely: The legislatures of the several states have the power to modify the operation of the first mentioned rule and to provide by statute that no landowner shall be privileged to take an undue proportionate part of the reservoir content. In other words, a legislature can provide for the enforcement of the ancient common law maxim that no man may so use his own property as unreasonably to injure his neighbors. Also, a state, acting through its legislature, has the power to require the conservation of its natural resources, especially when they are irreplaceable, as is oil and gas. That is, it may pass laws to prevent the waste or destruction of these resources and provide for their preservation for the use of present and future generations. Destroyed forests may be regrown, and yet, since their rehabilitation is slow, the state may prohibit their ruthless destruction or unreasonable use. Oil and gas cannot be regrown, nor can it be made by the hand of man, and it is hence, unlike timber, denominated an irreplaceable natural resource.

So the state has two powers, one to conserve these natural resources, and the other to protect the coequal and correlative rights of landowners who are so fortunate as to possess land containing them. The need, and therefore the principal reason for any such coequal right protective measures grows out of the peculiar natural characteristics of these substances as they lie beneath the lands of many proprietors.

The Wild Game Theory

It was shortly after the middle of the last century, some 75 years ago now, that the courts of some of the states began to lay down rules relating to the rights of landowners to drill and operate wells upon their lands for oil and gas production, and to evolve from first one consideration and then another, all leading to the same conclusion, the rule that one may operate his wells to exhaustion, no matter where in the subterranean reservoir he might draw from, and that he owns all which he withdraws, and that his neighbors must do likewise if they would make any effort to protect themselves.

But in 1900, 31 years ago now, the United States Supreme Court handed down an historic decision in the case of Ohio Oil Co. v. Indiana, 177 U.S. 190, 44 L.ed. 792. Therein it was held that the legislative power exists and "can be manifested for the purpose of protecting all the collective owners (of land in an oil or gas pool) by securing a just distribution to arise from the enjoyment by them of their privilege to reduce to possession. . . ." Let us not miss the force

*Presented at annual meeting, American Petroleum Institute, Chicago.

of the language used by the highest court in the land. It was held that a state legislature may pass a law for the purpose of protecting all the collective owners in an oil pool, each against injurious conduct on the part of all others in the production of oil and gas from the underground strata. In truth, the decision goes further than that, for it says that the protection which a state law may grant to the collective owners is to secure to them a just distribution of the oil and gas contained in the reservoir, the language being "by securing a just distribution to arise from the enjoyment by them (the collective owners) of their privilege to reduce to possession" the oil and gas beneath.

The decision would have been no less historic than the similar decision of the Supreme Court of Indiana previously handed down in the same case were it not for the fact that when the United States Supreme Court spoke we had a decision of the court of last resort on a most important constitutional question, the constitutional validity of an act of the legislature of a state abridging the right of an operator to produce as freely as he should choose. For the Indiana court to so hold did not settle the question except in Indiana, but for the Supreme Court of the United States to so hold settled the question for every state in the nation.

Recognize Coequal Rights

The decision is historic for the additional reason that it manifested a remarkably clear grasp of the physical facts of oil and gas production. The court was careful to point to the common law rule announced by the state courts that title to the land carried with it the right to the minerals beneath and the consequent privilege of mining to extract them, and quoted from decisions of the highest courts in Indiana and Pennsylvania holding that the surface proprietor has the right to reduce to possession the oil and gas beneath; but the court then said that there is a coequal right in them all to take from the common source of supply, and in that connection called attention to the peculiar qualities and characteristics of oil and gas held under pressure in the subsurface porous rock and the great injury which one producer can do to another by an excessive operation upon his lands. From these considerations the court came to the conclusion that there is a power in the legislature to protect the coequal and correlative rights of the several producers by legislation designed to secure a just distribution of the recoverable products. The court said that "there must arise the legislative power to protect the right of property from destruction." As demonstrating beyond any question that the rule announced by the court is applicable in states where the courts have held that oil and gas is owned in place by the landowner as well as in those states where the courts have held that there is no title in place but only a right to reduce to possession and thereby acquire title, the following statements of the court are quoted:

"If the right of the collective owners of the surface to take from the common fund, and thus reduce a portion of it to possession, does not create a property interest in the common fund, then the statute does not provide for the taking of private property without compensation. If, on the other hand, there be, as a consequence of the right of the surface owners to reduce to possession, a right of property in them in and to the substances contained in the common reservoir of supply, then, as a necessary result of the right of property, its indivisible quality, and the peculiar position of the things to which it relates, there must arise the legislative power to protect the right of property from destruction. To illustrate by another form of statement the argument is this: There is property in the surface owners in the gas and oil held in the natural resorvoir. Their right to take cannot be regulated without devasting them of their property without adequate compensation, in violation of the Fourteenth Amendment, and this although it be that if regulation cannot be exerted one property owner may deprive all the others of their rights, since his act in so doing will be damnum absque injuria. This is but to say that one common owner may divest all the others of their rights without wrongdoing, but the lawmaking power cannot protect all the owners in their enjoyment without violating the Constitution of the United States."

So, the court held that a law which does protect all by restraining everyone does not violate constitutional rights.

This decision has been approved or reiterated by the same court in a number of decisions handed down since 1900.

Bacon v. Walker, 204 U.S. 311, 51 L.ed. 499;

Noble State Bank v. Haskell, 219 U.S. 104, 55 L.ed. 112, 116;

Lindsley v. Natural Carbonic Gas Co., 220 U.S. 55 L.ed. 369;

West v. Kansas Natural Gas Co., 221 U.S. 229, 252, 55 L.ed. 716, 725;

Walls v. Midland Carbon Co., 254 U.S. 300, 65 L.ed. 276.

Legislative Power Exists

For 31 years now it has been established that the legislative power exists to secure a just distribution. It is the law today. In the meantime, the state courts, although still adhering to their former holdings with reference to the right of a landowner to produce all the oil and gas he can through wells drilled upon his land, have nevertheless freely admitted the legislative authority to provide otherwise. These rulings are admittedly subject to this legislative power.

The existence of this power furnishes an aswer to the question which was asked as to what can be done in view of the presence of the human element, so much encouraged as it is by the 75-year-old rule of law.

Let us make a practical application of this legislative authority to the particular program under discussion. To do so calls for a consideration of certain facts recently brought to light.

What is the meaning from a legal standpoint of the recent discovery and development by geologists and petroleum engineers of the existence and merit in this thing we call reservoir energy? Before its recent discovery oil producers knew, for it was a thing obvious upon the surface, that there was an expulsive force present in every newly opened oil pool, and that for awhile this force would drive the oil and gas out of the reservoir with great rapidity. They called it "rock pressure." It seems to have actually been believed that the more expeditious the utilization of this rock pressure, the greater the recovery of oil; it seems to have been feared that unless it was quickly used it would disappear. It later developed that one reason why it did sometimes actually disappear unless quickly used was because in many wells the inside string of casing was improperly seated and/or cemented in the oil-producing formation, with the result that there was a leakage of gas and pressure around the bottom of the casing into other strata lying above but having no or little pressure in them. In such a case, unless wide-open production was expeditiously had, the pressure would soon disappear. Furthermore, under the old rule of law, as found and declared by the courts, first in could, if he chose, be first served, and therefore first in used the existing rock pressure to his heart's content.

Reservoir Pressures

For a great many years producers seemed to have known little or nothing about what geologists and petroleum engineers have in recent years brought to light. They doubtless thought that the pressure in the reservoir could be permitted to escape without doing any other harm than to deprive other producers of its mere lifting power. They regarded it as of value only as a means for lifting oil through the well casing. The old-time oil producer seemed not to know that by the pressure, which increases as depths increase, free gas is highly compressed. as for example, when the depth is about 6,500 feet, as at Oklahoma City, 1,000 cubic feet of gas, measured at atmospheric pressure, occupies the space of about 1 bbl. of oil; and not to know that by reason of the pressure, tremendous quantities of gas are held in solution with the oil which lies beneath the free gas. He seemed not to know that this gas in solution with the oil very greatly decreases the viscosity of the oil and increases its ability and tendency to move through the small pores of the rock containing it. He seemed not to know that if there is a rapid expulsion of the free gas, the resultant expansion which occurs in the formation withdraws with great rapidity the gas which is in solution with the oil and leaves the oil where it lay and rises to fill the cavities created by the escape of free gas, and that it leaves very great quantities of the oil in a viscous and less fluid state in the pores where it originally accumulated. He seemed not to understand that when such a thing takes place the oil which remains behind can only be recovered by the application and use of highly expensive artificial methods, if it can be recovered at all; whereas, if the wells are cased low enough and are properly equipped to produce from only the oil-saturated portion of the formation and the flow is sufficiently retarded, then the gas in solution with the oil will bring with it as it moves along much of the oil with which it is immediately associated, and, in addition, highly compressed free gas will slowly find its way downward into oil-containing pores and will, instead of bypassing the oil, propel it in considerable measure to the well-bore.

Also, we are told that hydrostatic pressure plays a very important part in this picture. We are told that water, which is heavier than the oil, lies beneath or around the edges of the accumulated oil and usually the bed of water extends over areas reaching far away from the vicinity of the oil-containing formation and it presses hard from beneath and around the body of oil. As the gas and oil are relased through wells, the water forces its way in. Gas moves more freely through the sand pores than the oil or the water; and the water moves more freely than the oil. The result is that if there is an inordinate release of pressure, the gas and oil about the well rush out too fast for surrounding oil correspondingly to move in, and the water intrudes into the spaces of least pressure, the partially vacated pores, and it often comes to the well-bore in advance of the surrounding oil, thus causing what is termed "coning." We are also told that "channeling" occurs, and from coning and channeling oil is sealed off and becomes unrecoverable; whereas, if the flow of the wells is properly retarded the water will retain its position beneath or around the accumulated oil and cause the oil to follow ahead and upward so that the percentage of its recovery is increased.

Restricting Production

The combination of gas-carriage and water-drive are attainable only by means of a retarded operation of the wells in the field during the natural flow period. To properly utilize these forces constitutes an efficient utilization of what engineers call "reservoir energy." Competent engineers have asserted that although the potential capacity of the 800 wells in the Oklahoma City Field is around 10,000,000 bbls. of oil per day, and although large quantities of oil could be produced if these wells should be operated at or near their potential capacities, nevertheless, that if there should be any such operation thereof there would be left in the ground forever absolutely unrecoverable immense amounts of oil; whereas, by a substantially restricted flow of all the wells in the field the ultimate recovery will be increased, and they have asserted that no matter what the market demand for oil in that field should happen to be, still, if the greatest ultimate recovery is to be there had, the field should never be allowed to produce in excess of 300,000 bbls. per day, and that ratable taking must be enforced. In some fields there is very little free gas present in the formation, but always there is gas in solution with the oil and almost without exception beneath or around the oil there is a water bed. Whether there be free gas or not, the method of efficient operation above described is said to apply.

In the light of these recent engineering and geological disclosures, does it require

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COMPANY MANAGEMENT MUST ACT TO BETTER CONDITIONS, SAYS BOYD

In his report as acting chairman of the division of refining, W. R. Boyd, Jr., executive vice president of the American Petroleum Institute, said:

In a sense we, in the petroleum industry, are absurdly demoralized. Our business nerves are raw and frayed. Our business vitality is low. We say irresponsible things; we commit foolish deeds. We cry aloud for "leadership" when already there is a surfeit of it. What we need most right now are followers. All the leadership necessary to right conditions in the industry exists already in each company.

There is no magic way to restore prosperity in the oil business. No leader selected for the industry can make or enforce policies for any individual unit. But there is a common-sense method for finding the way back to prosperity, viz., for the management of each company refining oil in the United States to adapt its operations to the recommendations contained in the reports of the committees on economics of the institute and of the Federal Oil Conservation Board. Such action would instantly improve conditions if, indeed, it would not actually put the refining branch of the industry on a profitable basis in a surprisingly short time.

The statistical position of the industry has improved to some extent. Admittedly, good work has been done. Some reduction in gasoline stocks has been made; and some refining units, be it said to their eternal credit, have done as much as, or more than, their share. Nevertheless, it is plainly and, if I may say it, painfully evident that some units of the industry have paid little serious heed to the remarkably accurate forecasts of conditions. The result of weeks of intensive study, and of the experience and best judgment of groups of competent men of the industry, has gone into these reports. The generous expenditure of time, money and effort of these men, made with the sole motive of aiding the industry in general, deserves more attention and greater support than it has been receiving.

Believe it or not, economic factors that are just as plain as the nose on one's face are governing conditions in the petroleum industry. Unless managing executives of all refining units, whether operating independently or as part of an integrated company, keep informed and revise production operations so as to adjust, and keep adjusted, the delicate balance between the industry's supply of products and the current demand therefor, conditions cannot improve materially; there can be nothing more than a struggle on the part of each refining unit to survive until enough of the companies now failing or refusing to meet the problem intelligently go into bankruptcy and pass out of the picture.

The problems of the industry require solution by the industry. Representative groups within the industry must study the problems, and recommend solutions; but nothing can be accomplished, finally, without the independent acceptance of these recommendations by individual units. If any semblance of orderly progress in the restoration of prosperity for the refining branch of the petroleum industry is to be achieved, it must, and will, come through the serious individual support of those sound industrial programs developed by group action. In the very nature of our competitive enterprise, it cannot be done unless every refiner watches for, and heeds, the danger signals as they are given. For some to continue to beat the tom-toms of dissension is only to prolong the industry's agony, and to make themselves and their industry appear ridiculous.

Anti-Knock Standards— Today and Tomorrow

"If the industry is not careful it will find that it has educated the public to a false idea of gasoline value by octane number, just as many companies educated the public to a false idea by using the old Beaume gravity scale which today means just nothing at all as a single standard for gasoline

"Nothing at all is gained by companies' running up the octane number for sales purposes for above a certain point the motor does not know the difference Tomorrow's motor probably will require higher octane numbers but to sell fuel for the motor that does not exist is nonsense"

—Warren C. Platt in National Petroleum News

It's wisdom to make and sell gasoline that fully suits the motors that *do* exist today

Dubbs cracked gasoline does that

It's wisdom to have equipment in your refinery that will produce gasoline

to meet the higher anti-knock needs of the motor of tomorrow

The Dubbs process will do that, too

It's wisdom to blend Dubbs cracked gasoline with your troublesome straight run Then you have a fuel meeting today's anti-knock needs—a fuel you can sell at a profit

Dubbs cracking is the key to the whole gasoline problem—today and tomorrow

Universal Oil Products Co
Chicago Illinois

Dubbs Cracking Process
Owner and Licensor

Time Is Ripe for Unitized Production

Plan Will Be Forced on Industry If Not Accepted, Declares J. Edgar Pew. Survival of Fittest Leads to Disaster

By J. Edgar Pew
Sun Oil Co., Philadelphia, Pa.*

In the last 16 years improvements in oil refining have made it possible to double our recovery of gasoline from the barrel of oil.

In the next five years I am convinced that the industry can double its average recovery of crude per well, if it will unite on a unit plan of production, along with the conception that each owner in a pool is entitled to an equitable share of its oil and gas rather than to capture as much as he can, as fast as he can. United production is now recognized as technically feasible, economically sound, a means of conserving oil resources, and profitable.

I believe the time is ripe to accept this program. If we do not accept it of our own volition, it will be forced on us; and if we wait for this, we will face a long struggle with contradictory laws, conflicting regulations, hostile public opinion, and chaotic conditions within the industry.

In refining, the industry's advances rate it among the most progressive of manufacturing activities. In storage and transportation it has made a proud record; and in distribution and marketing it has brought its products, at low cost, within easy reach of every one of the country's 25,000,000 motor cars. Finally, gasoline taxes have provided a modern highway system for the continent.

Our weakness has been in production; a weakness for which the industry is not fairly to be blamed, because the laws have manacled it. But I am sure the time has come when a way of escape may be opened, if we shall but act unitedly, wisely, and with a view to both the public's and our own interest.

Advances in Refining Unparalleled

Consider what has been accomplished in refining. I know of no industry whose advances have outpaced our accomplishments in better, cheaper, more efficient refining. Petroleum's products are legion; the demand for them has constantly multiplied. We have not only kept up with this demand, but at the same time have made products less expensive and with constantly lessening drafts on our resources of crude. It constitutes an achievement I believe unparalleled by any other industry. We get more gasoline from one barrel of crude petroleum than, so recently as 1914, we got from two. This has been our response to demands for conservation, to warnings of possible exhaustion, and—most of all—to the industry's intelligent apprehension of its problems. Moreover, better pipe lines for crude, the piping of gasoline, gas-tight tanks, reduced fire hazards—these have saved millions of barrels of potential gasoline annually.

But in the producing branch we have been charged with recklessness, lack of vision, and deliberate unconcern for the public interest. Of these accusations I enter the broadest denial. The industry has at great cost systematically applied the lessons of science and experience. Deeper wells, improved drilling machinery, the aid of the geologist and the geophysicist, have enabled us to reach producing horizons that, a few years ago, might as well have been in the moon; better control has largely ended the wastes of flush production.

Production Still Greatest Problem

Nevertheless, production remains our greatest problem. The present practices in leasing and leasholding—the prevailing legal restrictions—prevent co-operations to lessen drilling cost, increase recoveries, and make our developed fields serve as reserves—leaving the oil in the ground until it is needed, instead of rushing madly to get it out regardless of whether or not there is need for it at the moment.

Because of the unreasonable restrictions now imposed on us, these things result:

1. A great waste of valuable gas which, if properly conserved, should be recirculated through the sands, producing more oil.
2. Improper development of the fields, causing water encroachments.
3. Loss in ultimate recoveries of oil estimated at 50 per cent.
4. A market condition that forces abandonment of smaller fields and wells because they cannot compete with oil uneconomically produced from flush fields.

The industry has lost hundreds of millions of dollars in the past five years through its producing methods. The public has lost as much in values, and stands to lose yet much more in future through increased prices. For its enjoyment of 10-cent gasoline today, the public will one day pay a heavy price penalty. The states will lose through unemployment and lessened taxation values.

It is not my purpose to go into details with which you gentlemen are thoroughly familiar. I am, however, challenging you frankly to consider with me these losses, and our responsibility. By our failure in dealing with production, we hold ourselves up as inefficient, blind, and lacking in the qualifications of good business men. We are subjecting ourselves to the menace of injurious legislation—perhaps of having the industry itself, second greatest in the land, as we are proud to say—wrested from our hands. Have we forgotten what happened to the railroads a few years ago? "Oh," you say, "but that was in a wartime emergency." Yes, it was; but today, in a time of peace, we see the grip of martial law fixed on more than half the country's oil production. Who shall say how far such a precedent may not be followed, or into what other fields? Who can insure the stability of our economic system when such things can befall?

Not Solved by "Survival of Fittest"

Our problem is not to be solved by cheerfully accepting a policy of "survival of the fittest." To such a program a small minority of the industry is still committed; but I say: That way lies disaster. We will have no peace through a war of extermination. The world's history since 1914 has surely proved this. If anybody imagines that by ruthlessly crushing the weaker units the excesses of production can be curbed, he is tragically mistaken. It would drive out all those splendid forces of adventure, initiative, individual effort, and bull-necked courage on which the industry depends for finding the hidden stores of crude. No program of eliminating these vital forces has ever worked or ever will. To seek salvation that way would be about as wise as Noah would have been if, instead of building "the Ark," he had started work on an irrigation system. Whoever would commit us to such a plan is forgetting the parable of the swine that got some distorted notions into their heads and hurled themselves into the sea.

But even if such a program succeeded, its success would be more unfortunate even than its failure. I would be sorry for the surviving "fittest" when he found himself alone on top of the petroleum world—object of all suspicion, target for all hatreds; ham-strung by impossible regulations, and an easy mark for the legislative experiments alike of half-baked radicalism and hard-shell demagogery.

How Supply and Demand Work

Of course there is always the good old law of supply and demand to fall back upon for defense of any unconscionable economic distortion. Whatever the law of supply and demand might mean in a free state of industry and economics, it has been pretty well repealed by practice and statutes; what is left of it needs policing to save it from legislative rape and judicial mayhem. That supply is determined by demand, and that in the long run they balance each other, is good enough generalization for the economist thinking in the absolute zero of a perfect vacuum; but let's see how it works. Whose "demand" caused East Texas to well nigh drown the industry? Whence has come the "demand" for huge, untimely and wasteful new production that repeatedly has brought chaos into the business? Certainly the industry didn't "demand" it; nor did the consuming public. The fact is that the oil industry, as now restricted by statutes and injunctions, by laws and decrees, is about as responsive to the classic law of supply and demand as Sir Isaac Newton's apple was to the gravitational pull of the planet Neptune.

Is it not time for us to recognize these things, and get together on a plan to solve our difficulties? You gentlemen, responsible to your stockholders and to your country, know it is time to act. Then why hold back? I say to you that if this meeting can agree on a plan and set up machinery for its operation, it will have rendered the institute's greatest service.

Unit of Co-operation Plan Best

I submit two suggestions. They look to economy, to conservation, to establishing an adequate reserve, and to making new production discoveries a safeguard rather than a menace. They are:

1. Complete and unqualified adoption of a unit plan of production.
2. Corollary to the first, the acceptance as fundamental that each owner in a pool is entitled to his equitable share in its oil and gas, as opposed to the present anarchic rule of everybody getting all he can as fast as he can.

Certain principles of unitization of an oil field were included in the plan which Henry L. Doherty advanced several years ago. I was among those who opposed him, not because we did not believe a unit plan of operating an oil field was desirable, but for the reason that the industry was almost unanimous in the opinion that the plan then proposed was, at least at that time, wholly impractical. I do believe that the best method of operating an oil field can only be reached through some kind of unit, or co-operative, operation. I believe that 75 to 90 per cent of the industry thinks the same. I want to see us united 100 per cent on that policy, and then go forward to the goal. Whether we agree with Mr. Doherty or not, he is entitled to great credit for having been one of the earlier advocates of the principle involved in this method of producing oil.

Unit operation would effect great savings in investment, in operation, in recoveries of oil, in conservation and proper use of gas for repressuring, etc. Clarel B. Mapes, technologist of the Mid-Continent Oil and Gas Association, has said that the greater Seminole pools, if unified, would have required 640 fewer wells. These at $85,000 each would have saved $54,000,000. Air-lift investments would hardly have been made, saving another $60,000,000 to $100,000,000. Mr. Mapes also claims that to properly utilize the gas from the average field is worth 25 cents per barrel of oil produced.

East Texas, with 100,000 acres of probable producing area, has 5,000 20-acre units. Drilled with one well to each 20 acres, as is a conservative estimate of what will take place under present practices, it will require 5,000 wells, costing about $100,000,000. If this field produces, as it is claimed it will, 20,000 bbls. per acre, and at the rate of 400,000 bbls. per day, it would require 14 years to get its production. The field will actually produce for a much longer period. Unit operation would have saved fully 50 per cent of drilling, or $50,000,000. If under present practices we drilled one well to 10 acres, as might easily happen, the saving by unit operation would be much greater. Further, with a 100 per cent saving of gas and repressuring therewith, much more oil would be produced, at much less cost.

Antitrust Laws No Longer Wise

My second suggestion, that each owner in a pool is entitled to his equitable share of its oil and gas, sounds startling in view of the history of the industry, and of court decisions allowing to each owner all that could be recovered through his property. I shall not discuss the legality of this theory, or the method of changing our laws to establish it. Conditions change, and conceptions of right and wrong change with them. The Hill railroads only a few years ago were prevented by the courts from merging, and public opinion sustained the courts. But a little later opinion had so reversed itself that Congress passed a law to force such consolidations; and now the railroad managements cannot effect them fast enough to satisfy either legislators or the public. I am convinced there has been a like shift of attitude toward the oil industry. Oil is produced in nearly half the states, and the industry is closer to more people than any other save agriculture. Its unique production problems are better understood by outsiders than we realize. Ancient prejudices against the industry have lost their edge. Antitrust laws are no longer accepted as the dicta of ultimate wisdom. Why, the President of the United States himself pointed the way for us. Do we forget what he, as Secretary of Commerce, said only a short time before he became his party's nominee? Let me recall it. I read from the famous Tulsa interview (published exclusively in The Oil and Gas Journal October 28, 1926):

"An amendment to the Sherman act, permitting oil companies to curtail their drilling activities in small localized fields, which may threaten to upset the conditions of the entire industry, seems to be advisable.

"I believe that the oil industry is clean. * * * When one considers the widespread distribution of gasoline, and the very limited amount of profit in a gallon of gasoline, surely not over 2 cents per gallon, considering everything, it is surprising. It is a wonderfully distributed product.

"You have the annual meeting of the American Petroleum Institute coming to your city in December; and if the members of this body can get together and formulate some plan regarding modification of the Sherman antitrust act, as applied to drilling flush fields, and properly present this plan, I see no reason why it should not receive favorable action at the hands of Congress.

"When the Federal Oil Conservation Board was formed there was a suspicion in the minds of all of them that it was created to harass and worry the oil business. That absolutely was not the intention. The Federal Oil Conservation Board was formed for the purpose of assisting the industry and helping it to work out whatever problems confronted it.

"In doing this work, it has already made a start; and other steps will follow. In assisting the Federal Oil Conservation Board, the industry can do much, and most of the remedies which will be helpful to the petroleum situation should originate within the industry itself."

Thus said Secretary Hoover in Octo-

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*Before American Petroleum Institute, Chicago, November 11, 1931.

Oil Business Is in Privileged Position

Other Industries, Without Similar Charts to Guide Them, Are Watching to See What Benefits Accrue From Marketing Code

By Edward G. Seubert
President, Standard Oil Co. (Indiana), Chicago, and Chairman, Division of Marketing, American Petroleum Institute*

The division of marketing of the American Petroleum Institute has taken an interesting part in the development of the oil industry during the past year.

The year had hardly begun when we received word from Washington that the Federal Trade Commission had radically revised our code of marketing practices. This necessitated changing our plan to hold a mid-year meeting of the division at Tulsa in May, such meeting being held in Chicago, March 2 to 4 instead. The principal discussion at that meeting concerned plans looking toward the reinstatement of our code. The committee representing the institute, Roy B. Jones, Henry M. Dawes, L. L. Stephens, Edwin S. Hall, and W. R. Boyd, Jr., arranged, subsequently, a public hearing before the Federal Trade Commission; related the story of each rule in the code and the particular practice in the industry it was intended to cover.

There are 60 regional and state code committees, and most of these committees meet monthly. The minutes of over 400 meetings of code committees have been received by the American Petroleum Institute, and checked before filing.

The committee on fire prevention in marketing and the committee on disposal of marketing wastes are preparing manuals of recommended practice on their respective subjects which, upon completion, should be very helpful. The committee on fire prevention in marketing, through a special subcommittee, is also conducting a survey of oil tanker and barge fires.

The committee on accident prevention in marketing is preparing a number of accident prevention manuals for the guidance of employes engaged on petroleum marketing properties. The first of these to be completed is the Manual on Safe Driving of Automobiles, which has been recommended for publication by the general committee.

The committee on automotive transportation has a tremendous field ahead of it; and these men, by working together, should be able to save large sums of money for the oil companies.

The committee on railroad transportation is one of the institute's oldest committees. Through its numerous subcommittees, it has accomplished much affecting problems in the transportation field.

Code of Marketing Practices

The re-approval by the commission of our code has given new life to code work. Changes made to meet the wishes of the commission have not materially lessened the value of the code as a guide to ethical conduct in marketing. Adherence will go far toward eliminating some of the main causes of unprofitable and unsound operations.

We cannot pretend that successful application of the code has as yet been attained. Many of the practices it condemns have appeared in the conduct of business within the last year. Yet, I believe we may fairly say that violations have been more the exception than the rule; that the educational force of the code is having its effect; and that we are on the road toward elimination of the faulty methods which it condemns.

In one shining particular many marketers have recently taken a step ahead of the code itself. Rule 1 condemns the practice of loaning or leasing equipment as unsound and uneconomic. But recognizing the difficulty of eliminating this unsound practice, the rule specifies the way in which it shall be carried on. A great many companies have now decided that the recommendation for discontinuance of the practice should be observed rather than the rules for continuing it. They have made a splendid beginning by taking a firm stand against loaning, leasing, or even selling dispensing and other equipment to dealer-customers. To this extent at least, they have stopped encouraging that multiplication of outlets to which may be ascribed a very heavy increase in marketing cost over the last several years. It is to be hoped that this move will receive concrete approval from all marketers, and lead toward further application in the interest of efficient and economical marketing.

Secret Violations of Code

Of the violations of the code which still come to attention, one most obviously deserving forceful condemnation is the practice of selling at prices other than those posted, by resorting to secret rebates, allowances, unusual credits, or other means. It is an astounding evidence of the frailty of human nature that some marketers yet resort to this practice. Gasoline is a commodity of practically fixed qualities and economic value, and is sold on a relatively narrow margin and having little in its nature to provide a basis upon which the consumer can compare relative merits. To bargain with the individual customer as to the price he shall pay is a weakness on the part of the marketer, which might be regarded as ludicrous were it not for the considerable extent to which it still influences the competitive struggle for business. It is, of course, apparent on the slightest examination that this practice is a sure cause for undermining of confidence in the marketer who resorts to it—that it can lead only to eventual loss of volume of business or profits, or both. Steady exertion of pressure against the practice should lead eventually to its complete discontinuance.

The oil industry stands in a privileged position in American industry on account of its marketing code. Other industries, so far without similar charts to keep them off the shoals of bad practices, are watching to see what benefits will accrue to the oil industry through the influence exerted by the code. It should be a matter of pride to the industry, and to all marketing units involved, to demonstrate that in adherence to reasonable marketing codes there is a way for business to avoid some, at least, of the senseless and unfair, and entirely harmful, results of unrestrained and reckless competition.

Damage Done by Sacrifice of Profits

In a year of depression, when the current oversupply of wheat has been increased by a great new crop and the oversupply of cotton has been aggravated so seriously that legislatures of southern states are now proposing reduction or entire omission of cotton production next year, when coffee is being dumped into the Atlantic or burned to reduce the supply, and when there is too much copper, too much coal, and too much of many other basic commodities in the world market, the petroleum industry of the United States has been peculiarly fortunate in that new supply has not entirely kept pace with demand.

In its statistical position the oil industry is getting on firm ground. Despite incidents which have threatened to destroy its security in this respect, it is making progress toward reduction of excess stocks—progress which can well be the envy of other industries staggering under the burden of surpluses which continue to increase.

Even in manufacturing and marketing of motor fuel, which is the highly competitive phase of the industry producing its major revenues, there was in the first half of 1931 an increase in volume of sales against an average decline in crude runs, or production. And this encouraging development has taken place in a year when the cause of the depression in business generally is being ascribed, in large part, to overproduction and underconsumption of goods.

Under these circumstances it is a cause for extreme chagrin to observe that not for many years, if ever before, has the oil industry had a year so disastrous in loss of earnings. With greater volume of sales of its principal product, and only slightly diminished volume of consumption of all products, with current demand exceeding current new supply, the industry has still played its part in the tragic drama of lessened activity, wage cutting, and dividend reductions which has become the despair of the United States.

Cause Found in Ruthless Competition

If we seek the cause for this anomaly of reduced earnings in the face of better balance of demand against supply, we can find it quickly in the ruthlessness of the competitive struggle in which the individuals and corporations composing the industry's organization are engaged. The good of the industry as a whole, and the eventual good of every component part, is being sacrified on the altar of greed for gallonage. While much is being done toward cutting down production, little or nothing is being done to stimulate the demand by creating new and additional consumption. Greed for additional business means, therefore, greed for business that somebody else already has.

Numerous ways of obtaining somebody else's business have been devised and tried, but the favorite has been, and probably always will be, price cutting. The producer reduces his price below the posted schedule to get an outlet for a few more barrels than he might otherwise sell; the refiner yields to an offer of a lower, and perhaps entirely unprofitable, price to keep his stills going; the marketer cuts prices to attract the patronage of motorists who have been going to his competitor's station across the street.

The immediate and logical result of price cutting is more price cutting. The competitor whose business is attacked by a price cut is forced to meet the price or lose business. Such struggles rarely remained localized. Originating independently at various points, they spread rapidly in all directions, until now the whole industry is involved. We have seen the process repeated often in the last two years. Disastrous, as it obviously is to the whole industry, including the very members of the industry with which such price cutting waves originate, no single unit or group has proved powerful enough to stop the spread of the contagion. It stops only when the excesses to which it leads have hurt all participants sufficiently to cause a return to a more sober and sensible line of reasoning.

Statistical Position Not Enough

We have discovered that a sound statistical position is of itself not sufficient to assure sound marketing of petroleum at any of the stages of its progress toward consumption, so long as any marketer has available more oil or oil products than he can readily sell. The individual who resorts to price cutting to dispose of a little more of his product, exercises an influence wholly out of proportion to his importance in the industry, because of the speed and generality with which his example is usually followed by those in competition with him and, in turn, by others to whom their influence reaches.

It may happen occasionally that those with whom waves of price cutting start are in actual distress, and can take no other course than to sell their products at whatever they will bring. It is possible that in many other instances they are misguided, by poor accounting practices, into believing they are going to make a profit when they have no chance to do so. It is also possible that some price cutting starts on the shaky theory that if customers can once be secured by sacrificing profits, advantages can be gained later by increasing prices. That theory may be workable in individual instances, but in the aggregate of its application it will certainly be the cause of advantage only for the purchaser.

We may well go back to fundamentals and ask: What is the purpose of the oil industry? Is it a philanthropy, intended to supply products to the public at the expense of stockholders, or is it a business undertaking intended to earn a reasonable return for capital employed in making the products of this basic commodity available to mankind?

Drift Toward No-profit Levels

In the last few years there has been a pronounced drift toward no-profit levels, or actual loss levels, in the prices of many of the basic commodities; wheat, coffee, rubber, iron, copper, oil, and many others. That drift must be stopped, if our whole economic structure is not to disintegrate. Without profit for capital, there is no incentive for accumulation of the vast amounts of capital necessary to the marvelous material developments which typify our age.

We must get back to the idea that operations in oil, and in every other commodity, must involve payment by the consumer of prices which will assure a fair return to labor, capital, and the genius of research and management which coordinate their use.

How shall the return to profitable operations be managed? That question is not easy to answer. We need further effort to establish a better balance between supply and demand. Although over a period of months in 1931 production has been at a rate lower than the rate of consumption, we have noted again recently a dangerous tendency to increase runs of crude oil at refineries. Stocks of motor fuel in storage have at once started on the upward trend as these increases of production have taken place. The storage stocks themselves remain too large for a sound statistical position, and the industry should make every effort to continue the good progress it has made on the average so far this year toward reducing stocks to the point where they will represent working supplies only, and not surpluses above the needs of the near future. If this needed further progress in improving the statistical position can be made, it will eventually aid restoration of that sound basis for marketing which we should all like to see.

Only One Branch Profitable

Some would say that we need to accustom our minds anew to the idea that the purpose of business is to make a profit. There is at present only one branch of the petroleum industry that is profitable. It has remained so through the depression. That is the transportation branch, which operates on rates or prices fixed and policed by a government organization. But our system of law frowns on price fixing in any other branch of the industry. It makes any efforts by which prices might be generally fixed by agreement at reasonable, but profitable, levels absolutely unlawful.

We are consequently forced to fall back upon the mass consequences of individual action. And here human weakness comes into full play. I do not point the finger of scorn at any one producer or refiner, or marketer or any group of these. We

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*Presented at twelfth annual meeting American Petroleum Institute, Chicago.

CONTROL

MANIFOLD and often conflicting are the factors in the problem of creating a successful Natural Gas system. Its very magnitude points to an adequate control—from conception to completion and operation—as a prime factor in making the investment profitable. One competent hand should hold the reins controlling the five spirited steeds—investigation, engineering, finance, construction, management.

IN THE organization of the Hope Engineering Company are men of engineering, of finance, of construction, of management—each a master of his specialty, yet accustomed to working with the others under one control, one policy, one responsibility, toward one common end. And that end is to provide every safeguard against loss to the investors in a Natural Gas system entrusted to the Hope Company.

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Causes of Pipe Line Corrosion Scanned

Some Correlation Between Long Line Currents and Corrosion Found, With Definite Relation Between Corrosion and Soil Resistivity

By C. R. Weidner and L. E. Davis
Prairie Pipe Line Co., Independence, Kans.*

The determination of soil corrosivity is of great economic importance to pipe line companies, both from the standpoint of protecting new lines and the reconditioning of old ones. K. H. Logan recently summarized a number of tests for the determination of the corrosiveness of soils, and pointed out briefly their limitations and essential features. Of the various methods described, Shepard's is one of the most practical for field use on account of the ease in making frequent and rapid tests of earth resistivity along a pipe line or along a proposed route.

Figure 1

E. R. Shepard in his pioneering work did not obtain complete and conclusive data, on account of the impracticability of examining the pipe lines to determine the pit depths. Stanley Gill and W. F. Rogers have made a complete pipe line current and soil resistivity survey for an 8-inch oil pipe line, 8 miles in length, located in the Texas Gulf Coast area. Their conclusions are different from Shepard's.

The purpose of the work described in this paper and the data presented are to supplement the work of previous investigators and to verify their results.

Factors Affecting Pipe Corrosion

In making a study of pipe line corrosion, it should be borne in mind that long line currents and soil resistivity are only two of a large number of factors or variables that affect the corrosion of pipe. Therefore, at the outset a list of some of the more important factors is given:

Soil conditions:

1. Electrical resistivity.
2. Classification—silt, loam, clay.
3. Texture—fine or coarse, colloids.
4. Chemical constituents—acid or alkaline.
5. Permeability—also ability to absorb and retain water from a lower level.
6. Cross-section—kind and depth of subsoil.
7. Origin—glacial, alluvial, underlying rock.
8. Age—amount of weathering.
9. Oxygen concentration.

Topography:

1. Ravines, creek and river crossings.
2. Slope, with or across pipe line.
3. Benches or flat places on a hillside.
4. Seepage, hillside springs.
5. Swamps and salt marshes.

Rainfall:
Amount and distribution.

Electric currents:

1. Stray currents from electric railways, power and telegraph lines.
2. Galvanic or long line currents.

Artificial conditions:

1. Oil leaks.
2. Drainage—from oil and gas wells, refinery and factory wastes, barnyards.
3. Road crossings.
4. Connections to other pipe lines.
5. Vegetation.
6. Cinder fills.
7. Protective coatings.

The authors recently have had the opportunity to measure the soil resistivity and pit depths along 58 miles of 8-inch oil pipe lines located in Oklahoma. This amount of pipe was being taken up for use in a different location. Long line currents were measured on only 11.4 miles of one line, as time and personnel did not permit taking these measurements for the entire mileage. Figure 1 shows the location and Table 1 the description of the pipe lines.

Measurement of Long Line Currents

The method and equipment used in measuring long line currents were the same as Shepard's. Where the line was uncovered, contacts were made with a C-clamp. Most of the contacts, however, were made with seven-eighths inch drill steel bars 42 inches long, diamond-pointed on the contact end. These were driven down to the top of the pipe, well tapped with a hammer to loosen any scale or rust, and foot pressure applied to the top, while the meter readings were observed. This method of contact proved to be rapid and satisfactory. No difference in the meter readings was observed whenever one method of contact was checked with the other.

The difference in potential between two points on the line 100 feet apart was measured with a standard millivolt meter with two scales—one graduated from 0 to 2.5 millivolts, the other from 0 to 5.0 millivolts. Connections from the line to the meter were made with 110 feet of 14-gauge weatherproof copper wire. The magnitude of the electrical current carried by the line was computed directly from the potential drop, using the equation 1 millivolt equals 1.37 amperes.

Measurements usually were taken 500 feet apart, except where the current was constant, in which case they were taken about 1,000 feet apart. Where the current discharged or reversed, measurements were taken every 100 feet, and in some cases every 25 feet.

Current measurements were taken only on two sections of the Kay County line. One section, 6.1 miles in length, was near the east end of the line; and the other section, 5.3 miles in length, was near the middle.

Observations on Long Line Currents

For the first 2 miles of the east section measurements were taken the day following an extremely heavy rain. The ground was thoroughly soaked from the surface to a depth below the bottom of the pipe. Some amazing reversals and discharges of current were observed for these 2 miles. The potential difference at all

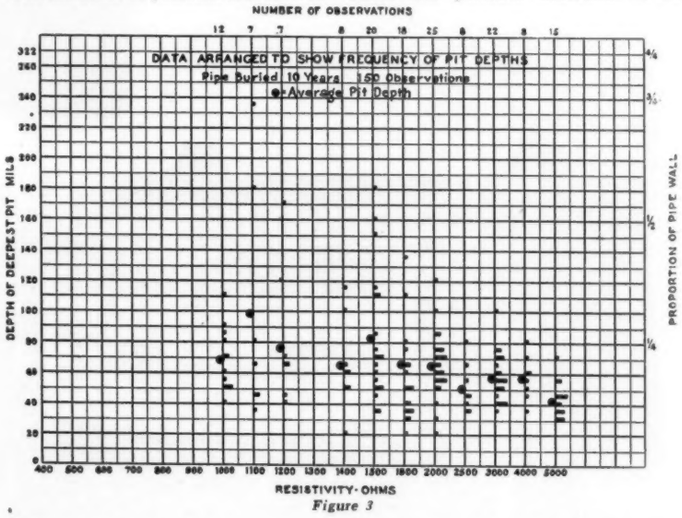

NUMBER OF OBSERVATIONS
DATA ARRANGED TO SHOW FREQUENCY OF PIT DEPTHS
Pipe Buried 10 Years 150 Observations
●=Average Pit Depth
DEPTH OF DEEPEST PIT MILS
PROPORTION OF PIPE WALL
RESISTIVITY-OHMS

Figure 3

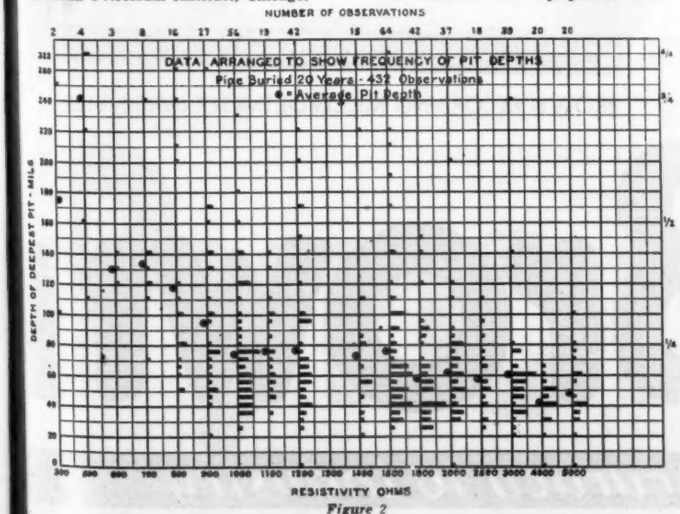

NUMBER OF OBSERVATIONS
DATA ARRANGED TO SHOW FREQUENCY OF PIT DEPTHS
Pipe Buried 20 Years - 432 Observations
●=Average Pit Depth
DEPTH OF DEEPEST PIT - MILS
PROPORTION OF PIPE WALL
RESISTIVITY OHMS

Figure 2

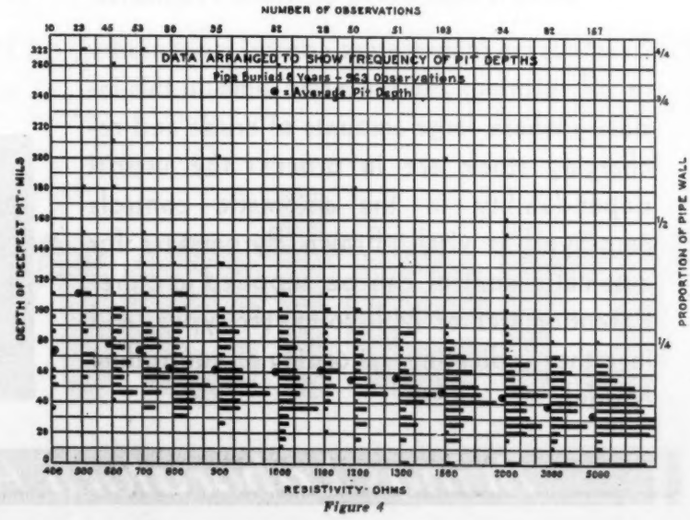
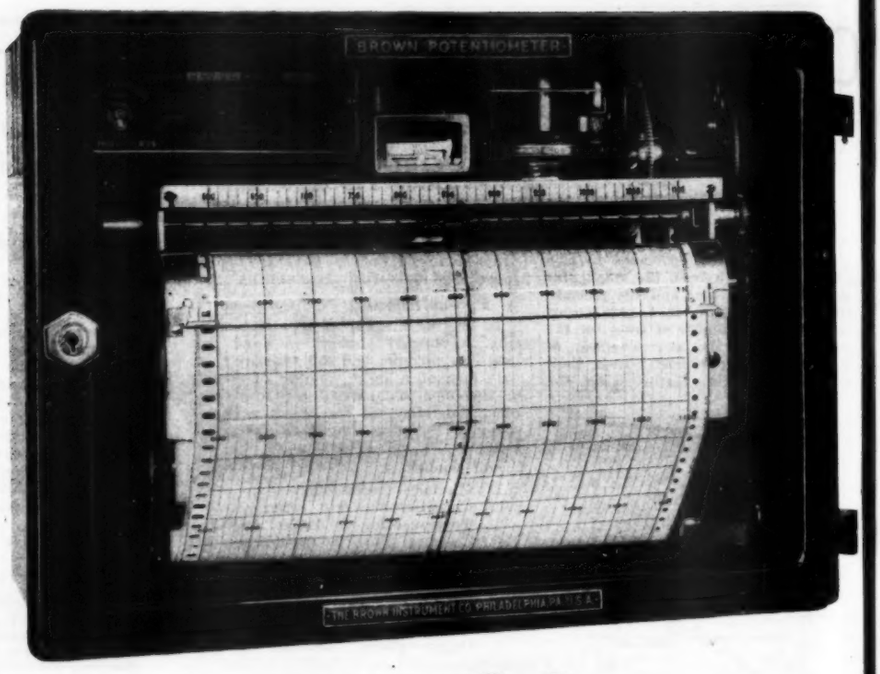

NUMBER OF OBSERVATIONS
DATA ARRANGED TO SHOW FREQUENCY OF PIT DEPTHS
Pipe Buried 6 Years + 563 Observations
●=Average Pit Depth
DEPTH OF DEEPEST PIT - MILS
PROPORTION OF PIPE WALL
RESISTIVITY-OHMS

Figure 4

points of reversal or discharge was greater than 5 millivolts. As this was the maximum measurement that could be made with the meter used, it was impossible to compute the exact amperes at these points. However, some interesting facts were developed. At all points of current discharge, with one exception, the soil resistivity was 1,200 ohms or less, the average being about 800 ohms. In the one exception mentioned the resistivity was 1,400 ohms. The pitting along these 2 miles was more general and relatively more severe than for the rest of this section. Since there were no known

(Continued on Page 144)

*Presented at twelfth annual meeting of American Petroleum Institute, Chicago.



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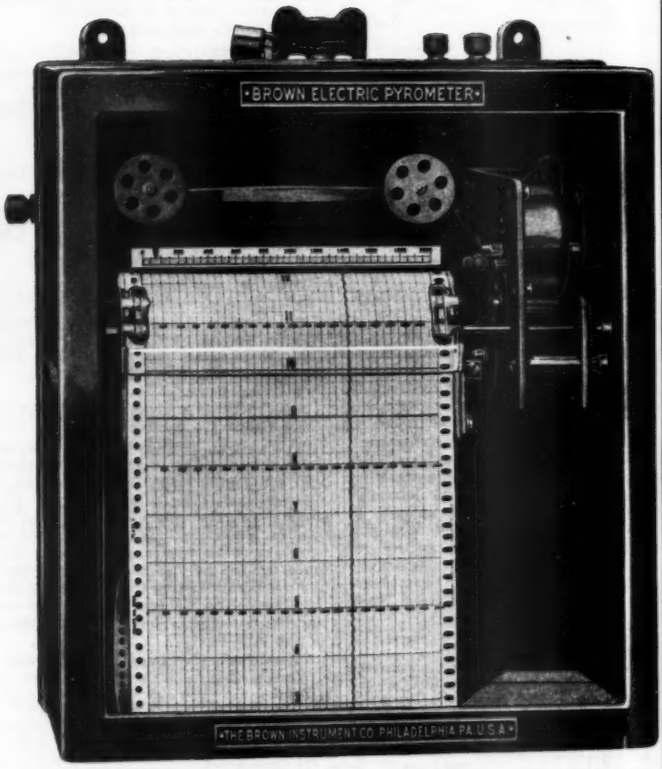

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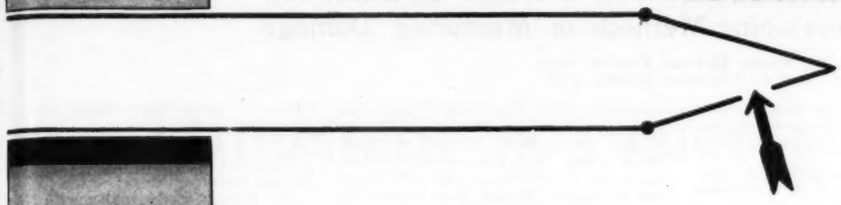
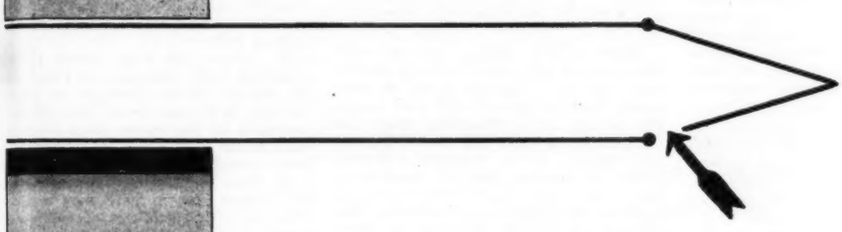
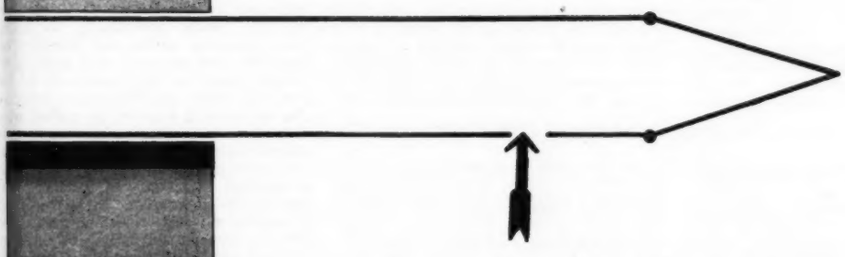


and a thermocouple wire breaks or burns out



— or a binding post works loose



— or a lead wire opens

— or a short-circuit or "ground" occurs

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Corrosion Losses Should Receive Study

Little Precise Information Available Because of Scant Attention Given to Developing Methods of Measuring Damage

By Stanley Gill and Fred W. Karl
Gulf Oil Companies, Houston, Tex.*

For purposes of evaluation, the losses which arise from corrosion of petroleum production equipment may be divided into the following classes:

A. Destruction of equipment: These losses are concerned only with the actual value of the material which is destroyed as a result of corrosion.

B. Cost of repairs: This includes the expenditures which are necessary to overcome losses arising from corrosion, and to restore equipment to its previous condition.

C. Losses of production: This includes the value of oil lost during the shutdown periods, and which would be recovered if it were not for corrosion.

D. Indirect increases in production cost: Corrosion results in great increases in lifting costs, aside from those arising directly from the necessary replacement of equipment. Under this head may be included the following costs which are caused by corrosion but seldom charged against it:

1. Water troubles resulting from punctures of casing.
2. Extra pulling jobs to replace cups cut by accumulation of corrosion products from rods or tubing.
3. Decreased pump efficiency due to corrosion of working barrels and balls and seats, entailing an increased power consumption.
4. Increased cost for treating the emulsion formed by excessive fluid slippage past corroded balls and seats.

E. Water flooding of sands: Admission of water through corroded casing has resulted in water flooding of sands in certain fields.

F. Accelerated production decline: Corrosion of certain items of well equipment results in rapid decline in production rates, and this diminishes the total quantity of oil which is recovered from a well. In extreme cases corrosion may result in the loss of a well before it has completely drained the surrounding sand, and thus makes necessary the drilling of more wells than would otherwise be necessary to drain a field.

The several sources of loss are discussed in some detail below, and the factors which enter into the evaluation of each are described.

Destruction of Equipment

The most obvious source of corrosion loss is in the destruction of casing, tubing, tanks, and other equipment. For this reason the importance of actual depreciation of material is usually overemphasized in considering the corrosion problem. Actually, of course, the value of the corroded equipment constitutes a very great source of loss. It is not, however, of greater importance than are other, less considered phases of the problem. In a sense, the apparent simplicity of estimating the losses which result from destruction of material results in inaccurate estimates of corrosion losses. If a piece of equipment fails by corrosion after 10 years of service, it is exceedingly simple to estimate the annual corrosion loss as one-tenth of its initial value. Such a procedure is, however, entirely erroneous, and gives an exaggerated value for the losses, since it fails to take into account normal depreciation and obsolescence. If, for example, normal mechanical wear would have resulted in failure of the equipment in question after a service of approximately 10 years, the corrosion has not resulted in any loss of material whatsoever. In the same way, if the discarded equipment has any junk value, this junk value should be credited against the corrosion losses. Upon these considerations, the following simple means of evaluating losses of material are predicated:

(1) Actual loss of material equals depreciated value at time of failure minus scrap recovering value.

In order to determine the "depreciated value of equipment at time of failure," it is necessary that a method be devised for determining what life could be expected from the specific item of equipment if it were not subject to any corrosive attack. This immediately establishes a depreciation rate from which the "depreciated value of equipment at time of failure" is determined. Methods by which the life expectancy of each class of petroleum production equipment may be determined are detailed below:

Casing

In estimating the service life which would be expected from casing strings, if it were not for corrosion difficulties, it is necessary to differentiate between inside and outside casing strings.

Outside casing strings should last for the life of the well; i.e., the casing should remain in serviceable condition until production has declined to a point where further operation of the well is not economically justifiable. Because of the difficulty and expense of recovering outside casing, it can properly be considered as possessing no value at the expiration of this period. Instances in which a profit can be derived from the recovery of outside casing are not sufficiently frequent to invalidate the above reasoning. From the characteristics of a field and from the rate of production decline, the probable ultimate economic life of a well, from the production standpoint, can be calculated; and this figure can be applied directly as a normal life expectancy for outside casing. Therefore, the actual loss of material which results from the corrosion failure of an outside casing string may be expressed as follows:

(2) Actual loss of material equals initial cost of casing times 1 minus age at time of failure divided by estimated economic life of well, minus scrap recovery value.

Inside casing strings, on the other hand, are in most cases entirely recoverable, and the value for re-use is practically equal to the value of new casing. The service life is dependent only upon the number of times the material is reused. Hence, for all practical purposes, it may be assumed that the value of inside casing results in a loss of material equal to the value of new material. The formula for loss by corrosion of inside casing may be expressed as:

(3) Actual loss of material equals initial cost of casing, minus scrap recovery value.

Corrosion is not, of course, the only cause of casing failure; but the other causes, such as cutting of casing by wire lines, wear by tubing, shifting of formation, etc., cannot properly be considered as characteristic, even of one field. They should, therefore, be classed as well troubles, and the resultant losses treated as operating expense.

Tubing

Corrosion shortens the life of tubing in the following ways:

A. Pitting of the tubing with the development of tubing leaks.

B. Thinning of the tubing walls by corrosion. This results in reduction of the metal cross section, and consequent loss of strength of the tubing.

C. Corrosion fatigue, resulting in a reduction of endurance limit and in mechanical breakage of tubing under load conditions which would not otherwise result in failure.

D. Mechanical wear (worn threads) resulting from corrosion of other items of well equipment. Corrosion of working barrels, balls and seats, etc., makes it necessary to pull tubing more frequently than would be the case if such corrosion were absent.

If these factors of depreciation were not present, i.e., if there were no corrosion, the ultimate life of a tubing string would be dependent upon:

A. Wear caused by pulling to replace worn working parts within the well.

B. Fatigue failures due to the alternate stress set up in the tubing by normal pumping operations.

Even in a well in which absolutely no corrosion is experienced, it is necessary to pull tubing periodically to replace worn standing valves and working barrels. The frequency of such pulling will depend upon the life expectancy of both standing valves and working barrels, and the tubing will have to be pulled whenever it becomes necessary to replace the shorter-lived of these two. Methods for determining the normal life expectancy of working barrels and of balls and seats are detailed later. Thus, it is possible to determine, for a given territory and depth of well, how often it would be necessary to pull tubing if there were no corrosion. However, this is not sufficient to establish the normal life expectancy of a tubing string, since there are no data which define the number of times tubing threads may be made up and broken down before becoming worn to a point where mechanical failure is imminent.

Subject to Cycles of Stress

In normal pumping operation, a tubing string is subject to cycles of stress variation to a number of several millions per year. On the upstroke of the sucker rods, the tubing carries only its own weight; on the downstroke of the rods, this weight is increased by the weight of the fluid column. This establishes a stress condition which will result in fatigue failure, provided the range of stress variation is beyond the endurance limit of the pipe material. The conditions under which fatigue failure of tubing would occur, if it were not for the influence of corrosion, are defined in Figure 1. This diagram combines two distinct graphs, which are superimposed for convenience. The first of these, which is represented by the portion above the line OU, is the familiar Goodman diagram, which defines the safe range of tensile stress variation within which fatigue failure will not occur, regardless of the number of cycles. The second portion of the diagram, which lies below the line OU, defines the range of variation in tensile stress at the root of the threads of the top joint of tubing. The derivation of Figure 1 is discussed below. The "ultimate depth" is that depth at which the stress set up within the tubing, by the weight of the tubing and the fluid, is equal to the ultimate tensile strength of the tubing material; hence, it is ob-

(Continued on Page 138)

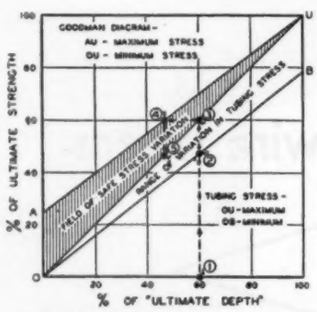

Figure 1. Fatigue stress in tubing.

DERIVATION OF FIGURE 1

From the work of Launhardt and Weyrauch, Goodman (Mechanics Applied to Engineering, p. 624) constructed the diagram shown in the upper portion of Figure 1. Experimental data show that for a stress alternation from zero to a tension, the limiting stress for safety is one-half the ultimate tensile strength; i.e., a ferrous metal will endure an infinite number of stress variations from no load to one-half its ultimate tensile strength without failure. As the minimum stress is increased, the maximum is raised until at the ultimate they are equal. This is based on tests of prepared specimens where the section considered is smooth and continuous. For variation of the cross-section in the metal the endurance limit is decreased until, for sharp V-threads, the value is one-fourth that for a uniform cross-section (the Fatigue of Metals, Moore and Kommers, p. 141). Since the A.P.I. thread is not a sharp "V," but is truncated, the endurance limit has been arbitrarily set as half way between that for a smooth section and for sharp V-threads. This locates the point A at 25 per cent of the ultimate tensile strength. According to Goodman, the line of minimum stress, OU, is at an angle of 45 degrees to the axis. By connecting the points A and U, the diagram is completed. The ordinates have been plotted in percentages to make the diagram applicable to any numerical value of ultimate tensile strength. This portion of Figure 1 simply shows what minimum stress is safe at any given maximum stress, or vice versa. The lower section of the figure gives the stresses which are set up in the tubing under the conditions assumed. For this purpose the following data were selected: A—a fluid of specific gravity equal to 1.00; B—a steel of 75,000 pounds per square inch ultimate tensile strength (A.P.I. specification, grade "C," seamless tubing); C—⅝-inch rods in 2-inch tubing, ¾-inch rods in 2½-inch tubing, and ⅞-inch rods in 3-inch tubing. From these data the following were computed:

TABLE 1

Fluid specific gravity=1.00; ultimate tensile strength of steel=75,000 lb. per sq. in.			
1. Size of rods.....	⅝	¾	⅞
2. Size of tubing ...	2	2½	3
3. Wt. per ft. tubing —min. load per ft.	4.60	6.40	9.20
4. Wt. per ft. fluid..	1.23	1.84	2.80
5. Max. load per ft..	5.83	8.24	12.00
6. Cross-section of metal at root of threads	0.801	1.20	1.82
7. Ultimate load	60,000	90,000	136,700
8. Ultimate depth ..	10,290	10,930	11,380
9. Tubing wt. load at ultimate depth..	47,250	70,000	104,700
10. (9) ÷ (7)	0.788	0.788	0.766

1, 2, 3, and 4 are self-explanatory.

5 is the maximum load per foot of depth, being the total of tubing weight and fluid weight.

6 is the cross-sectional area of metal at the root of the first perfect thread, the weakest joint on the tubing.

7 is the ultimate total load this cross-section 6 will support; ultimate strength divided by area 6.

8 is the maximum depth which can be reached without exceeding the strength of the steel; ultimate load divided by load per foot; 7 divided by 5.

9 is the tubing weight load at ultimate depth 8; ultimate depth 8 multiplied by 5.

10 is the ratio of tubing weight load, the minimum stress, to the total load, the maximum stress; or as shown is 9 divided by 7.

By definition, the ultimate depth corresponds to the ultimate tensile strength of the steel, which locates the point representing it vertically below U. Since the three valves of 10 are very close, one line is used to represent them, locating the point B at 78 per cent of the ultimate strength of the steel. Both abscissa and ordinate are plotted in percentage, so that the graph is applicable to any steel, regardless of the numerical value of its ultimate tensile strength and to any combination of rods, tubing, and fluid where the ratio 10 is 0.78. Other combinations of rods, tubing, and fluid will change the slope of OB, and each combination will have a different numerical value for the "ultimate depth," 8, as is shown by the data given in the table.

*Presented at twelfth annual meeting American Petroleum Institute, Chicago.

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Pure Hydrocarbon Improves Flow of Lubricating Oil at Low Temperatures

* * * * * *

By G. H. B. Davis* and A. J. Blackwood†

During the past few years increasing pressure has been brought to bear upon the manufacturers of petroleum products for improved lubricants for low temperature operation. The response of the oil industry to these demands has been apparent in the advertising material to be found in the press and radio programs of various manufacturers, emphasizing totally dewaxed lubricants of low cold test.

Dewaxing to low pourpoint has generally been thought of as giving improved lubricating oils. Dewaxed oils have been advertised as synonymous with high quality oils so generally that in many quarters the relationship is accepted as absolute fact. There remained, however, some doubt as to the soundness of the conclusion and by careful investigation it was found that, with the exception of the lowered pour, there was a definite evidence that severe dewaxing lowered rather than bettered the quality of motor oils. It is the purpose of this paper to clarify this situation and to introduce a new method of producing improved paraffin base oils of low pourpoint.

The immediate effects of dewaxing upon the physical characteristics of a lubricant are as follows:

1. Pourpoint. The most significant facts in connection with low pour (other factors being the same) are, that it has very little if any influence on ease of cold weather starting, or cranking speed at low temperatures; but that it does aid the flow of oil to the bearings in cold weather, which tends to minimize engine wear during and immediately after starting has occurred.

Actual tests on motor cars at low temperatures have been reported by Blackwood and Rickles[1], and by Larson[2], showing that cranking speed is not affected by pourpoint. That is to say, cranking speed is a function of the extrapolated temperature viscosity curve rather than of the higher false viscosity of paraffin base oils below their pourpoints.

Lederer and Zublin[3] carried out tests on a laboratory set-up consisting of a cylinder moving up and down at constant speed against a piston hanging on a balanced beam. The work corroborates the above in that hard starting does not follow the false viscosity of oils below their pour. They feel, however, that pourpoint has some bearing on cold shear resistance.

That pourpoint plays an important part on the pumping of oil to engine bearings is a well-established fact. Lederer and Zublin point out that channeling at the pump with paraffin base oils occurs at about 10° F. below the pourpoint. They also find that at the temperature corresponding to the pourpoint or slightly above the quantities pumped of various oils of the same viscosities at 210° F. are roughly proportional to their viscosity indices.

Becker[4] finds that extrapolated viscosity at the temperature of pumping and the pourpoint of the oil are of equal importance in getting an adequate supply of oil to the bearings when starting a cold engine. Mougey[5] states that high pour oils are responsible for excessive wear in engines during cold starting due to the lubricant not reaching the wearing surfaces quickly enough.

The data in Table 1 from the Standard Oil Development Co. files illustrates these points. The tests were made on a Cadillac pump submerged in the oil and delivering to a simulated connecting rod bearing.

TABLE 1—EFFECT OF VISCOSITY AND POUR ON OIL PUMPABILITY

Oil—	Pour °F.	Visc. at 210° F.	Visc. at 5° E. Say. (secs.)	Time (secs.) for oil to reach bearing at 5°F.
Penna. motor oil....	30	49	16,000	30
Penna. motor oil....	25	62	55,000	120
Mixed base motor oil	0	49	32,000	16
Coastal motor oil...	0	49	56,000	42

These indicate that for oils of the same viscosity at the temperature of test, a 25° F. pour oil requires about three times as long to reach the bearing as does a zero pour oil. Similarly, for oils of the same pour, the more viscous will require the greater time. It will be noted that channeling at the pump did not occur with the high pour oils in these tests.

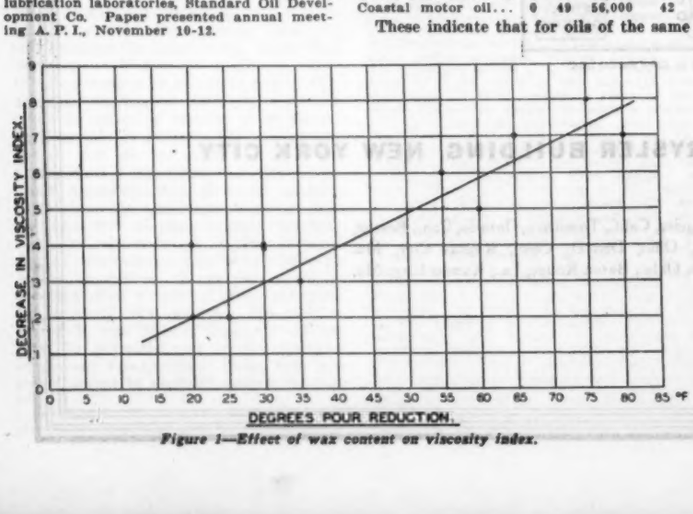

Figure 1—Effect of wax content on viscosity index.

Figure 6—Plant located at the Bayonne, N. J., refinery of the Standard Oil Co. of New Jersey where Paraflow is manufactured.

* * * * * * * * * *

2. Gravity. The A. P. I. gravity is lowered in taking out wax, as shown by the inspection data given for typical samples later in the paper. The relation of the gravity (in and of itself) of lubricating oils to their performance in motor car engines is not known. Secondary relationship going to gravity as an index of other properties are of course important and in part at least well understood.

3. Temperature-viscosity relationship. The temperature-viscosity relationship (hereafter referred to as viscosity index—see reference No. 6) is made less favorable by dewaxing. This change is important and is not always apparent from a casual inspection of the physical characteristics of commercial lubricants. Oil samples of known antecedent, all having approximately the same viscosity at 210° F. and in the same gravity class are given in Table 2 and Figure 1, and illustrate the change in viscosity characteristics, showing definitely that the presence of wax in an oil helps to maintain an improved viscosity-temperature relationship (that is, a high viscosity index). This is readily understandable since it can be demonstrated that some waxes have apparent viscosity index values over four times as high as the very best paraffin base oils. The significance of viscosity index is definitely demonstratable in its effect upon cold starting, pumping and oil consumption.

TABLE 2—EFFECT OF WAX CONTENT ON VISCOSITY INDEX OF LUBRICATING OILS

Oil—	A. P. I. gravity	Viscosity at 100°F.	Viscosity at 210°F.	Pour °F.	Viscosity index	Remarks
A	29.1	468	62.2	—10	99	
A + 4% wax	29.1	450	62	20	103	(*)
A + 6% wax	29.2	442	62	45	105	(*)
B	28.9	470	62.2	—10	99	
B + 4% wax	28.9	461	62	20	100	(*)
B + 6% wax	28.9	447	62	40	104	(*)
C	28.1	498	62.5	—10	93	
C + 4% wax	28.0	479	62.4	20	97	(*)
C + 6% wax	28.1	471	62.6	40	99	(*)
D	28	500	62.9	100	94	(†)
D after dewaxing	27.2	522	62.5	20	87	
E	27.9	515	63.5	85	94	(†)
E after dewaxing	27.7	532	62.9	10	86	
F	28.7	421	62	40	110	
F + 5% wax	29.3	365	59	75	113	(‡)

*Samples A, B, C were first dewaxed. The wax removed was then added back for the 4 and 6 per cent wax blends. †Viscosity at 100° F. determined from viscosity at 210° F. and 130° F. ‡High melting point paraffin wax added in this case.

Engine Starting

As pointed out above, the results of careful investigations carried out on cars at low temperatures have proven that cranking speed (torque resistance) is dependent upon the extrapolated viscosity of the oil being examined. In other words, for oils of the same viscosity at 210° F. the high viscosity index oils will start easier. Another way of looking at this is to consider which oil is the more suitable for both starting in cold weather and subsequently operating a hot engine at high speeds and loads. The cold starting requires a low viscosity at starting temperatures; the operating conditions require a reasonably high viscosity to provide adequate lubrication without excessive consumption. The high viscosity index oil undoubtedly comes nearer meeting these requirements than the low viscosity index oils.

The question of pumping has already been discussed in regard to the effect of pourpoint. Since the extrapolated viscosity of the oil at the temperature of pumping was shown to be fully as important as low pourpoint, it follows that the high viscosity index oils will provide safer lubrication than a low viscosity index oil of the same viscosity at 210° F.

A great deal has been written on the question of oil consumption. So far as the lubricant is concerned, it is generally agreed that the viscosity at the operating temperature is the most important single factor contributing to low oil consumption. Perhaps the best study of this

*Development and research department, Standard Oil Co. of Louisiana. †Fuel and lubrication laboratories, Standard Oil Development Co. Paper presented annual meeting A. P. I., November 10-12.

question has been presented by H. C. Mougey[8], who lists four properties of the oil as affecting oil consumption. These are:

(a) Viscosity of the oil.
(b) Volatility of the oil.
(c) Pour test.
(d) Carbonization of oil control rings.

Mougey also says that the literature shows that for easy starting at 0° F. an oil of not over 50,000 seconds at that temperature is essential; and that an oil meeting this requirement will have too low a viscosity under high speed operating conditions, resulting in high oil consumption. Obviously it is undesirable to treat an oil in any way which may decrease its normal viscosity index.

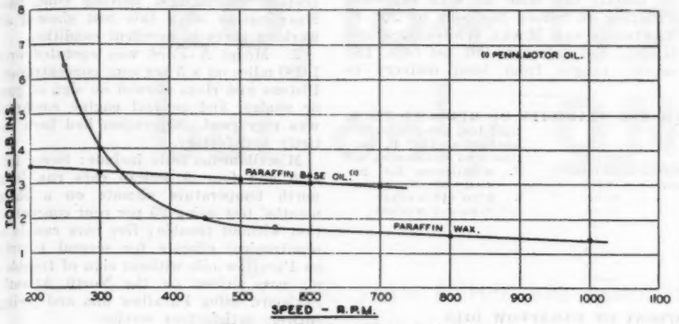

Figure 2—Special oiliness tests.

4. **Conradson carbon.** Paraffin base, wax-containing oils have always been known to have high Conradson carbon values, and often this has erroneously been associated with the wax content. Actually the Conradson carbon of paraffin wax is nil and Ries[7] finds that increasing percentages of wax result in decreasing Conradson carbon. Data from the laboratory files bear out the statements of Ries (see Table 3).

The importance of Conradson carbon has been a subject of debate for years. In the last analysis, there seems little doubt that the work of Morley, Livingston and Gruse[3], showing the correlation between carbon formation and Conradson carbon, holds true for oils of the same type and processing. Hence we may expect greater carbon formation from a dewaxed motor oil than from the same oil undewaxed.

TABLE 3—EFFECT OF WAX ON CONRADSON CARBON

	Conradson carbon
1. Naphthenic base oil	0.241
2. Naphthenic base oil + 2% wax	0.184
3. Naphthenic base oil + 5% wax	0.128
4. Paraffin base oil	0.79
5. Paraffin base oil + 5% wax	0.72

5. **Volatility.** The effect on volatility is somewhat difficult to demonstrate since in dewaxing motor oils the usual procedure is to dilute with naphtha and after dewaxing remove the naphtha by reducing to flash or viscosity. The picture of what happens may be found by examining the lower part of vacuum Engler distillation data for oils before and after dewaxing. Table 4, showing distillation temperatures at 10 mm. pressure, illustrates the higher volatility—and, by direct interpretation, the lower flash and firepoints—of the dewaxed motor oil.

TABLE 4—EFFECT OF DEWAXING ON VOLATILITY OF LUBRICATING OILS

	Penn. motor oil		200 Penn. neutral		Extra heavy motor oil	
	Waxy	Dewaxed	Waxy	Dewaxed	Waxy	Dewaxed
Gravity	29.4	28.5	29.9	29.8	29.0	27.2
Vis. @ 210° F.	56.2	55.5	45	45	73	73
V. I.	113	98	103	103	...	87
Flash °F.	420	*395	405	405	520	500
Pour °F.	110	5	25	0	90	15
Engler Distillation at 10 mm. Pressure						
I.B.P. °F.	454	450	408	426	490	486
2 per cent	463	460	454	452	545	554
5 per cent	478	476	462	458	585	565
10 per cent	497	493	471	465	592	576
20 per cent	526	516	483	476	602	590
30 per cent	547	537	486	485	610	602
40 per cent	568	556	494	492	618	612

*Probably in error.

The connection between volatility and flash-fire points is well recognized. Reference has already been made to the literature[5] showing that volatility affects oil consumption, being greater for the more volatile oils.

Degree of Vaporization

The degree of vaporization occurring in the crankcase of an automobile is not always apparent to the operator. It frequently occurs that with oils having low boiling constituents the oil level gauge will indicate a rapid rate of consumption. However, after makeup is added, the consumption appears to settle down to a slower and more uniform rate. The reason is that the light fractions have volatilized off, leaving the heavier constituents in the crankcase. These of course make for lower consumption. From an inspection of the data shown in Tables 4 and 5, it is clear that the dewaxed oil would show higher volatility loss in an engine.

6. **Resistance to Oxidation.** To study the effect of dewaxing upon the stability of oils toward oxidation, six oils were subjected to a severe oxidation test. This test consists of measuring 300 cc. of oil into a flask and placing it in an oven for 12 hours. During this period, 5 cubic feet of air per hour is bubbled through the sample. The temperature is maintained at 450° F. for the oils above S. A.E. 30, and 400° F. for lower viscosity oils. At the end of 12 hours the samples are inspected for sludge formation, change in viscosity, development of acidity and volatility loss.

Table 5 shows data for the original and oxidized oils, and clearly shows the inferiority of the dewaxed oil. These data show the disadvantage of dewaxing in three ways:

1. Volatility loss is higher for dewaxed oil, forecasting higher engine consumption.

2. Sludge is very much higher, forecasting more crankcase sludge and greater trouble from ring and valve sticking.

3. Viscosity at 210° F. is increased, forecasting gumming of engine parts, faulty operation of filters and increased frictional losses.

TABLE 5—RESISTANCE TO OXIDATION

	Original oil data			Oxidized oil data					
					Vis. @	Pct. vol.			
Oil—	Grav.	Vis. @ 210° F.	Pour °F.	Grav.	210° F.	loss	Acid. mg. KOH	Sludge pct.	Temp. of test
1. Motor oil medium	28.6	54	80	27.4	58	8.7	0.65	0.74	400° F.
2. Same oil dewaxed	27.4	53	15	26.3	67	14.5	0.30	1.57	
3. Motor oil heavy	29.0	63	85	27.2	67	2.4	0.35	0.76	450° F.
4. Same oil dewaxed	27.3	62.8	15	26.0	73	4 8	0.35	1.61	
5. Motor oil extra heavy	29.0	73	90	26.8	114	7.7	0.30	1.23	450° F.
6. Same oil dewaxed	27.2	73	15	23.4	108	8.1	0.35	3.57	

The relation between oxidation characteristics of lubricants and their performance in an internal combustion engine is too uncertain to warrant definite claims. Undoubtedly the oils most resistant to oxidation will maintain their lubricating value longer than the unstable oils. But contributing factors such as moisture in the crankcase, dilution, acidity from the combustion products, effect of metals on different oils, and others, all tend to make good correlation difficult.

It has been observed that piston ring sticking, stopping of drain holes in the scraper ring groove, and clogging of oil ring slots are usually attributed to poor high temperature stability rather than to carbon forming tendency alone. The reason for this is that the oil collects around the rings and is cooked at high temperature under oxidizing conditions. In the combustion chamber the oil is actually burned, whereas around the rings it is simply heated to high temperature without ignition.

7. **Coefficient of Friction.** In 1918 Hardy[9] reported data pertaining to the coefficient of static friction of paraffin. His data show the paraffin waxes to be slightly superior to other hydrocarbons of equivalent molecular weight. He also concludes that for a given chemical series the coefficient of friction falls off with increasing molecular weight and that the relation is not affected by melting point continuing as we go from liquids to solids. Some of Hardy's data are shown in Table 6. It is to be noted that some of the paraffins compare favorably with oleic and stearic acid, both commonly used in lubricating oils.

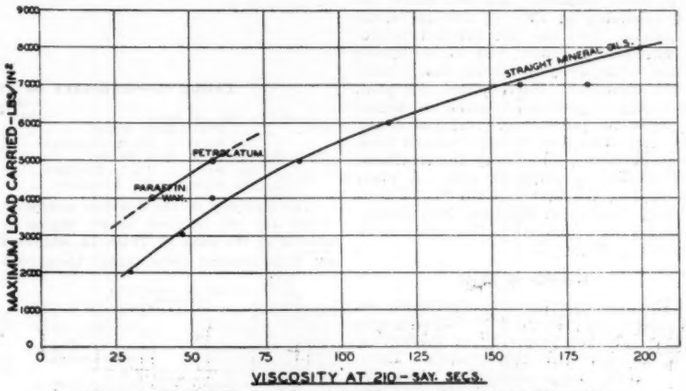

Figure 3—General Motors pin and bushing machine tests at 100 r.p.m.

TABLE 6—COEFFICIENT OF FRICTION FROM HARDY'S DATA

Acids—		Hydrocarbons—	
Oleic	0.10	Octane	0.32
Stearic	0.15	B.P. paraffin*	0.20
		Paraffin (87° F. M.P.)*	0.09
		Paraffin (115° F. M.P.)*	0.07
		Benzine	0.34
		Naphthalene	0.29
		Anthracene	0.26

*Approximately.

Tests on dynamic friction machines at the Bayway laboratories show that the paraffin waxes have better friction resistant qualities than the oils from which they are derived. Figures 2 and 3 show this point clearly. The characteristics of the particular oiliness machine from which the data in Figure 2 were taken are such that viscosity effect has very little influence on torque values and consequently the low position of the curve for wax is very significant. These data were obtained when operating at extremely high bearing pressures. The General Motors pin and bushing machine has been used extensively to determine load carrying capacity of lubricants. The data from this machine, Figure 3, indicate that paraffin wax is superior to oil lubricants of the same viscosity at 210° F.

Under the conditions of normal operation in internal combustion engines, the variation in frictional coefficient (aside from viscosity effect) is negligible. Mougey[10] finds this so-called oiliness effect of minor importance in normal operation. However, under unusual situations, such as reduction in lubricant supply, unusually tight fitted bearings, undue reasonable dilution of the oil, and during the starting up and stopping periods, it may be argued that the high oiliness of certain oils will carry over the temporary deficiency without undue wear on the parts. To the extent that this conclusion, so difficult to weigh experimentally, is sound, the extra factor of safety in a wax containing oil may be of value in running in new motors, and during the initial operating period in cold weather.

The foregoing discussion has shown that dewaxing an oil while improving the pourpoint has resulted in giving a product inferior with regard to viscosity index, Conradson carbon, volatility (including flash and fire points), oxidation stability and lubricating value as compared to the undewaxed oil of the same viscosity. Individually the changes in most of these items is small but collectively they are of sufficient importance to require serious consideration when producing oils of the highest quality. For this reason the significance of each item as related to performance in a motor car has been analyzed. Considering the trend in automotive design toward units requiring better lubricants, it looks as though the corresponding trend in part of the oil industry in the direction of higher degrees of dewaxing is progress of doubtful value since low pour oils are produced only at the expense of other essential lubricating oil properties.

New Process

The Standard Oil Development Co. has worked out a method of obtaining oils which flow freely at low temperatures and has attained this end without the degradation incident to dewaxing. It has been found possible to supply a product (U. S. Patent No. 1,815,022) which has all the desirable properties of a wax-containing oil plus the low pour of the dewaxed oil. The method involves the addition of a very small quantity of a specially prepared pure hydrocarbon lubricating oil, capable of reducing the pourpoint of paraffin base oils without the necessity for severe dewaxing. An inspection of this product (called "Paraflow") is given in Table 7.

TABLE 7—TYPICAL INSPECTION OF PARAFLOW

Gravity °A.P.I.	23.8
Vis. @ 100° F.	3,612
Vis. @ 210° F.	214
Viscosity index	106
Pourpoint °F.	25
Flashpoint °F.	555
Conradson carbon	1.99
Color (Robinson)	¼
Cast	Green

It has been found that addition of one-fourth to 1½ per cent of this Paraflow to paraffin base oils reduces the pourpoint from around 30° F. to below 0° F. Typical inspections of motor oils with and without Paraflow are given in Table 8.

It is seen from these data that the pourpoint is lowered greatly by small additions of Paraflow. The pour reduction properties of this product may be simply and strikingly demonstrated by cooling two samples in ordinary 1-quart dispensing bottles in an alcohol bath chilled by carbon dioxide snow. The Paraflow

treated oil will remain fluid long after the untreated oil has ceased to flow.

TABLE 8—TYPICAL INSPECTIONS OF PARAFLOW BLENDED MOTOR OILS

	S.A.E. —30 motor oil	Same +1% Paraflow	S.A.E. — 10 motor oil	Same +1% Paraflow	Spindle oil	Same +4% Paraflow
Gravity °A.P.I.	27.4	27.5	30.6	30.4	30.9	
Vis. @ 210° F.	62.3	62	43.2	44.3	44.4	
Vis. @ 100° F.	481	474	150	161	156	
V.I.	96	97	90	99	107	
Pourpoint °F.	30	—10	30	—10	25	—50
Flashpoint °F.	415	415	380	395	385	
Conradson carbon	0.815	0.829	0.014	.055	....	
Color (Robinson)	2¼	2	11	10	10¾	
Cloud °F.	...	...	52	46	....	
Demul. @ 130° F.	1,620	1,620	1,620	1,620	....	
S.E. No.	30	30	30	30	....	

It is well known that certain soaps, acids and other foreign addition agents produce a lowering of the pourpoint of mineral oils. These foreign agents invariably are objectionable, usually unstable, and can be readily removed from the oil. Paraflow, on the other hand, is a straight hydrocarbon lubricant which is completely miscible in the oil and cannot be detected or extracted by any of the usual methods. As seen above, the demulsibility at 130° F. and the steam emulsion tests are not affected by the addition of Paraflow, and oils so treated show no tendency to develop slimy crankcase emulsions. Furthermore, pourpoint lowering so produced is stable in storage even in the presence of incidental water. In fact, Paraflow is not removed from the lubricating oil even by the treatment of alkalies or sulphuric acid. A plant erected at the Standard Oil Co. of New Jersey refinery at Bayonne, New Jersey, started into production this fall and is shown in Figure 6.

Results of Tests

Prior to entering into production on Paraflow, an exhaustive investigation was made into the properties of lubricating oils blended with this product. There were three things concerning which absolute certainty was required before the product could be used commercially. First, was the reduced pour a stable characteristic of the blended oil, or would storage, repeated cooling and heating, or use in an engine destroy the advantage gained? Second, was the product in any way harmful to an engine as for example from the standpoint of instability, corrosiveness, ring sticking, carbon formation, oil consumption, sludge formation or valve stem sticking? Third, were the lubricating properties impaired in any way, either from the viewpoint of viscosity index, frictional losses, loss of oiliness, or cold starting of motors? Some of the results of these tests are given below.

1. Pour Depression and Stability of the Reduced Pour. In the course of the work on Paraflow it was soon apparent that the effect produced varied from oil to oil; one-fourth per cent reduced the pour 35° F. in one oil, while another oil required 1 per cent for the same effect. Hundreds of tests have shown that type of oil, type of wax in the oil, method of finishing, and many other factors determine the susceptibility to Paraflow.

The stability of the reduced pour has been examined for different kinds of oils and different concentrations of Paraflow. To make the tables as short as possible, the data giving both effectiveness and stability for selected samples are shown in Tables 9 and 10.

TABLE 9—EFFECT OF PARAFLOW ON POUR AND STABILITY OF REDUCED POUR

Oil—	Vis. @ 210° F.	Orig. cold test ° F.	Per cent Paraflow	Reduced cold test ° F.	Cold test (° F.) after 25 days	Degree reduction of test ° F.
Filtered Cyl.	140	35	1.0	30	30	*5
Penn. Brt. Stk.	153	25	1.0	25	25	*0
Mid-Cont. Mot. Hy.	74	30	1.0	Flows @ —5	—5	35
Mid-Cont. Mot. Ex.Hy.	110	25	1.0	20	20	15
Heavy Turbine	51	30	1.0	Flows @ —5	—5	35
Red Oil	50	25	1.0	Flows @ —5	0	25
Ranger Lt. Res.	96	30	1.0	(no data)	5	25
Penn. Med. Mot.	62	30	0.75	—10	—10 (3 mo.)	40
Penn. Neutral	150/100° F.	30	1.5	—10	—10 (3 mo.)	40
Penn. Neutral	150/100° F.	30	1.5	—10	—10 (3 mo.)	40

*Viscosity of these oils approximately 200,000 seconds at pour temperature, and true pourpoints difficult to determine.

With reference to Table 9, it will be noted that there was but small change in the pourpoint of the high viscosity bright stocks. However, if these same oils were blended with high pour neutral oils, low pour motor oils would result.

In addition to the above, Paraflow has been added to oils of 30° F. and 35° F. pourpoint and kept at 0° F. for four months. The samples are still fluid showing that gradual wax crystallization has not occurred.

TABLE 10—EFFECT OF PARAFLOW ON POUR AND STABILITY OF REDUCED POUR

Oil—	Orig. cold test ° F.	Per cent Paraflow	Reduced cold test ° F.	Cold test after alternate heating at 180° F. daytime and holding at 35° F. nighttimes for period of weeks
A 75 vis./210° F.	15	1.0	0/no	0/no (10 weeks)
B 75 vis./210° F.	15	1.0	0/no	0/no (6 weeks)
Engine Oil	30	0	30	
52 vis./210° F		0.5	10	
		1.0	0	
		2.0	0	
		4.0	—15	
		6.0	—15	

TABLE 11—STABILITY OF POURPOINT OF PARAFLOW OILS

Engine and oil used—		Orig. pour, °F.	10 hrs.	20 hrs.	30 hrs.	35 hrs.
Ford	(1) Penn. Med. Motor	35	30	30	30	30 (1% dilution)
	(2) Same + 1½% Paraflow.	0	—10	—10	—10	—10 (0.8% dilution)
Chevrolet	(3) Penn. Med. Motor	35	35	35	35	35 (0.4% dilution)
	(4) Same + 1½% Paraflow.	0	—5	—5	—5	—5 (0.2% dilution)
	(5) Same + 2% Paraflow...	0	—10	—10	—10	—10 (0.8% dilution)

The stability of the lowered pourpoint when the oil is used in an engine is shown by the data in Table 11, obtained on dynamometer tests rather than road tests to keep the dilution effect to a minimum.

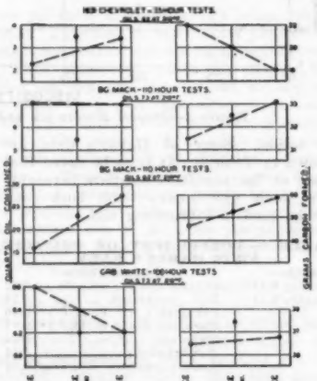

Figure 4—Engine dynamometer tests.

Oxidation Stability. Many tests have shown that Paraflow does not decrease stability of an oil toward oxidation. Typical data show:

62 vis. Penn. Med. Oil = 0.024% sludge after 12 hrs. oxidation at 450° F.
62 vis. Penn. + Paraflow = 0.020% sludge after 12 hrs. oxidation at 450° F.

These data would indicate that stability is the same for Paraflow treated oils as for the untreated oils. Since it has already been shown (see Table 6) that dewaxing an oil results in lowering its resistance to oxidation, it follows that a Paraflow treated oil has better stability than the corresponding dewaxed oil.

Performance Data

2. Performance in Motor Cars. Data on the performance of Paraflow blended motor oils in actual service have been accumulating over a period of two years. The data are too voluminous to incorporate fully in this paper and only a condensed summary of our results is presented.

(a) Road Tests. Thirty-one trucks in regular service in the Standard Oil Co. of New Jersey domestic sales fleet were placed on a five months' test. Approximately half of them were run on heavy motor oil (S.A.E. 30), and the remainder on exactly the same oil with sufficient Paraflow to reduce the pour by 20° F. The trucks were Macks, Whites, Reos and G.M.C., and aggregate 261 net tons. The service ranges from local delivery to trans-state tank and trailer delivery units. The data are summarized in Table 12.

TABLE 12—RESULT OF FLEET TEST ON PARAFLOW OILS

	Heavy motor oil	Heavy motor oil + 1½% Paraflow
Total miles on test	79,310	116,864
Av. miles/qt. oil	32.8	33.1
Av. miles/gal. gas	3.8	4.2
Av. engine rating*	6.3	6.5

*Based on a value of 10 as perfect and includes visual ratings of valve sticking, sludging, corrosion, carbon, wear, etc., as determined by systematic inspection of the motors when examined at the end of the test.

These data show no detrimental features in a Paraflow blended oil, and if any advantage exists it is in favor of the treated oil.

In addition to the fleet truck test, many road tests have proven Paraflow lubricates satisfactorily. In no instance has 1 per cent blended into an oil showed to poorer advantage than the untreated oil.

To check the effect of using more Paraflow than required to lower the pour, two tests are of interest:

1. A Studebaker President Eight was run 4,700 miles on a 10 per cent concentration under hard driving conditions. Examination after this test showed all working parts in excellent condition.

2. Model A Ford was operated over 1,000 miles on a 5 per cent concentration. Pistons and rings showed no sign of gum or sludge, and general engine condition was very good. Operation had been entirely satisfactory.

Miscellaneous tests include: Seven foreign and four American cars run in a north temperature climate on a three months' test using 25 per cent concentration without trouble; five cars run in a semitropical climate for several months on Paraflow oils without sign of trouble; six cars driven on the North Atlantic Seaboard using Paraflow oils and giving entirely satisfactory service.

(b) Dynamometer tests. — Data are shown for four dynamometer tests on various engines. The usual procedure is to run these engines at approximately five-eighths to three-fourths full throttle, and at speeds corresponding to about 65 per cent of the maximum speed the engine would give in a unit on the road. Duration of the tests varied from 35 hours to 110 hours, depending upon whether or not makeup oil was permitted during the tests. In each instance several runs were made on each engine in order to iron out any irregularities of engine operation. The oil consumption and carbon data are best shown in graphical form, as given in Figure 4.

Differences in power and fuel economy are almost impossible to determine for oils of the same kind, and are not presented here. Qualitative data for these same tests on such things as piston ring condition, valve sticking, crankcase sludge and the like are shown in tabular form in Tables 13 to 16, inclusive.

TABLE 13—NOTES ON ENGINE CONDITION
100-Hour White Engine Test

	Average of two runs on reference oil	Same reference oil + 1 per cent Paraflow
1. Piston rings and grooves.	Very slight carbon behind rings. No sludge around ring grooves.	Very slight carbon behind rings. Faint indication of sludge in grooves.
2. Crankcase.	Some sludge; oil good color; some metal particles.	Faint indication of sludge; oil good color; no metal.
3. Valve stems (inlet) (exhaust)	Clean and well lubricated. Clean and well lubricated.	Clean and well lubricated. Clean but somewhat dry.
4. General appearance cylinder walls, pistons, etc.	Fair.	Excellent.

TABLE 14—NOTES ON ENGINE CONDITION
110-Hour Mack Engine Test
(62 viscosity oil)

	Average of two runs on reference oil	Same reference oil + 1 per cent Paraflow
1. Piston rings and grooves.	Some moist gummy carbon. Slots in oil ring one-half filled.	Very little moist carbon. Slots in oil ring only one-fourth filled.
2. Crankcase.	Considerable sludge; oil poor color; no metal.	Considerable sludge; oil poor color; some metal. a
3. Valve stems (inlet) (exhaust)	Clean and well lubricated. Clean and well lubricated.	Clean and well lubricated. Clean and well lubricated.
4. General appearance cylinder walls, pistons, etc.	Excellent.	Fair.

TABLE 15—NOTES ON ENGINE CONDITION
110-Hour Mack Engine Test
(73 viscosity oil)

	Average of two runs on reference oil	Same reference oil + 1 per cent Paraflow
1. Piston rings and grooves.	Slight carbon behind rings. Oil ring slots fairly clean. One oil ring stuck.	Practically no carbon behind rings. Oil rings free and exceptionally clean.
2. Crankcase.	O. K.	O. K.
3. Valve stems (inlet) (exhaust)	Clean and well lubricated. Clean and well lubricated.	Clean and well lubricated. Clean and well lubricated.
4. General appearance cylinder walls, pistons, etc.	Good.	Very good.

TABLE 16—NOTES ON ENGINE CONDITION
35-Hour Chevrolet Engine Test

	Average of two runs on reference oil	Same reference oil + 1 per cent Paraflow
1. Piston rings and grooves.	Fairly clean.	Fairly clean.
2. Crankcase.	O. K.	O. K.
3. Valve stems (inlet) (exhaust)	Clean and well lubricated. Clean and well lubricated.	Clean and well lubricated. Clean and well lubricated.
4. General appearance cylinder walls, pistons, etc.	Good.	Good.

No Detrimental Features

When all data on dynamometer tests are analyzed, it is apparent that the use

(Continued on Page 128)

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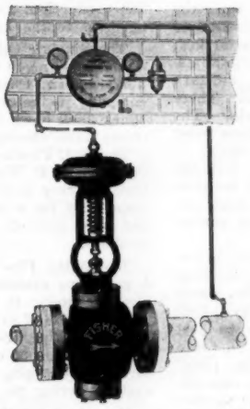

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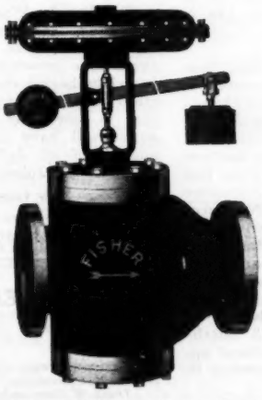

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Slow Up Operations in East Texas

Reduction of per Well Allowable to 125 Bbls. per Day Affects New Locations and Number of Daily Completions

By L. E. Bredberg

DALLAS, Tex., Nov. 9.—Production in the East Texas oil field was cut back from 150 to 125 bbls. per well per day, effective Saturday morning November 7, in accordance with the order of Gov. Ross S. Sterling, announced Thursday.

This, the fourth reduction since the field was reopened under martial law, will be administered by military authorities. There are 2,803 producers in the field. The production will be reduced from over 400,000 to about 351,000 bbls. daily.

The reduced well allowance will not interfere with future adoption of an acreage-basis plan to protect the small operators from burdensome drilling competition, Governor Sterling said.

A gradual decline in activities is expected to continue, companies marking time to await a new proration plan which Governor Sterling will obviously adopt for the district. It is not known just what kind of a plan will be put into effect, proponents of the "acreage plan" hoping that their plan will be adopted, and feeling it is the best for the district and industry, while others have still other plans which they think better than this plan, and still others hope that the present per well allowable will be continued.

Operations Slowing Up

Locations in the East Texas district are falling off each week, only 99 having been reported in the past week, the first time in many weeks that there have been less than 100 locations reported.

Completions also fell off from 172 in the week ending October 31 to 149 in the past week, a drop of 23.

Trend of Production

Production fell from 421,336 bbls. from 2,816 producing wells on November 7, the last day of production under the old 150-bbl. per well allowable, to 353,463 bbls. from 2,826 wells on November 8, the first day's production under the new 125-bbl. per well allowable. Pipe line runs from the district on the November 7 were 433,513 bbls. while on November 8 they were 396,234 bbls., showing that 43,000 bbls. was taken from storage on the latter date, while only about 12,000 bbls. was taken from storage before the field was cut to the lower figure.

Produced 87,517,000 Bbls.

The East Texas Field was 13 months old on November 6 and has produced approximately 87,517,000 bbls. according to one company's set of figures.

An Important Test

Cranfill & Reynolds' No. 1 Bush in the Eubanks Survey, Upshur County, approximately 1½ miles north of the DeArmand dry hole, logged the base of the Pecan Gap chalk at 2,897 feet, nearly 100 feet higher than the dry hole to the south. Elevation of the test is 329 feet. It is expected to reach the Woodbine sand around minus 3,250 feet. It is now drilling ahead in shale at 3,445 feet. Operators in East Texas are watching closely to see if it is to extend the field farther to the north, or prove conclusively that production is not to go beyond the DeArmand test. Buying has been stimulated in this area, and J. Green purchased 400 acres south of the test and east of the DeArmand test this week for a reported $22,500 cash consideration and $45,000 out of oil. Royalty prices have been increasing in the neighborhood of the test.

Material is moving in for a test by the Leonard Petroleum Co. on the Perry farm in the northwest corner of the L. N. Sparks Survey, southern Rusk County, approximately 2½ miles south of the nearest production on the Mid-Kansas Oil & Gas Co.'s Mason lease in the Cadene Survey. The latter company completed its No. 1 Mason, a southern extension well in the Joiner area, for 175 bbls. per hour through open tubing, which proves a good well, making the acreage farther to the south look good for production, and giving more encouragement to the Leonard test.

The Sinclair Oil & Gas Co. apparently do not have much hopes for production in northeastern Cherokee County as the company is releasing all leases in its Black Jack block in that area. Forty-five tracts have already been released.

The Gulf Production Co. has turned its 162-acre W. B. Walker tract in the St. L. Davis Survey to S. P. Shelburn of Oklahoma City for a reported sum of $1,500 per acre out of one-fourth of the oil produced.

The Atlas Pipe Line Co., which has a gathering system in the Lathrop area, Gregg County, is to gather and deliver 125,000 bbls. of crude and deliver to the Arkansas Pipe Line Co. at its Lathrop pumping station, east of the field. The former is charging 5 cents for gathering and delivering the oil.

Reports from the field state that the Petroleum Pipe Line & Storage Co. is endeavoring to sell its two 55,000-bbl. tanks and 3,700 feet of 4-inch gathering line which it constructed some time ago when oil was selling for 10 cents per barrel. When the price of the oil advanced the company did not carry out the proposed plan of buying more oil and holding oil. However it did purchase several hundred thousand barrels before the price advanced.

The Panola Pipe Line Co. has been delivering 3,000 bbls. of oil per day to the Sinclair-Texas Pipe Line Co. on a short time contract, getting 5 cents per barrel gathering charge, but it is understood that the latter company does not care to renew the contract and another outlet will have to be sought for this amount of oil daily. This oil is produced in the Joiner area, Rusk County.

New Gasoline Plant

The Lisbon Gasoline Co. has started construction on an eight-unit gasoline plant on the E. E. Moore lease of the Mid-Kanas Oil & Gas Co. and is to process all gas produced by this company. The lease is in the Cadene Survey, in the southwestern part of the Joiner area, Rusk County. O. J. Dykes of Shreveport is head of this company.

The Chicago Bridge & Iron Works has completed construction of one of the two Horton spheroid 80,000-bbl. welded tanks at the East Texas Refining Co.'s Longview plant, and is now constructing the second one for the company. These are the two largest Horton spheroid tanks ever constructed. One is for storage of crude oil and the other for the storage of gasoline refined at the company's plant.

The Petroleum Refractionating Co., owned by the Bell Oil & Gas Co. and Danciger Oil & Refining Co., is now testing its 10,000-bbl. refinery at Footes Switch, 3 miles south of Longview on the I.&G.N. Railroad. It will be supplied with crude from the latter company's leases in Gregg County. This will probably be the last plant to be constructed in the district for some time, several of the smaller plants standing shut down at present for lack of crude oil.

Wildcat Failure

Another wildcat test has been abandoned in Rusk County. This test was the A. W. Jones' No. 1 Menefee, located 1½ miles southwest of Dirgin. Total depth of the hole is 2,758 feet. Some Longview parties are considering drilling another test in this area, on the basis of the showings made in the Menefee test.

Bramlett has sold his 10-acre Goforth lease in the Chisum Survey, Gregg County, to Lonnie Glasscock for $3,000 cash and $14,000 out of one-fourth of the oil produced on the lease.

The Atlantic Oil Producing Co. has purchased from the Houston Oil Co. and J. K. Wadley, a 100-acre tract on the T. W. Lee farm, 10 acres on the same farm and 84 acres of the Joe Bender farm, all lying in the David Ferguson Survey, Gregg County. The consideration is reported to have been around $250,000. This is the largest sale made in the district for some time, and strengthens the position of the former company, insuring more oil for the Atlantic Pipe Line Co.'s 10-inch trunk line to the coast. The latter company is an associate of Atlantic Oil Producing Co.

The East Texas district had approximately 3,000,000 bbls. of crude oil in storage on November 1. Runs from storage totaled around 15,000 bbls. per day during the first week, but increased on November 8 when production was cut to 125 bbls. per day per well, thereby cutting daily production to 353,463 bbls. on that day.

Activities in the Van Field took a spurt this week when the Pure Oil Co. announced four locations and the Sun Oil Co. one location. There are now nine active tests in the field, including the deep Trinity test on the V. T. Davis farm which is now reaming to straighten a crooked hole. Total depth is 3,606 feet.

Daily average oil movement from East Texas week ending November 2:

SHIPMENTS THROUGH TRUNK LINES

Company, size and destination—	
Atlantic P. L. Co., 10-inch, Atreco	19,200
Arkansas P. L. Co., 8-inch, Shreveport	18,321
Atlas P. L. Co., 8-inch, Shreveport	17,442
Gulf P. L. Co., 2 and 8-inch, Oklahoma	22,264
Gulf P. L. Co., 2 and 8-inch, Port Arthur	11,044
Humble P. L. Co., 2 and 10-inch, Shreveport	45,440
Humble P. L. Co., 2 and 8-inch, Todd	48,426
Liberty P. L. Co., 8-inch, Rusk	4,108
Magnolia P. L. Co., 10-inch, Center	22,844
Magnolia P. L. Co., 12-inch, Corsicana	48,409
Shell P. L. Co., 10-inch, Houston	25,067
Sinclair-Texas P. L. Co., 12-inch, Teague	35,864
Sun P. L. Co., 10-inch, Sun City	25,535
Texas P. L. Co., 10-inch, Douglass	40,952
Texas Empire P. L. Co., 12-inch, Port Arthur	35,010
Tidal Refining Co., 6-inch, Carthage	3,825
Total	423,740

SHIPMENTS TO REFINERIES

Arrow Refining Co., Overton	552
Beacon Refining Co., Henderson	702
Boone Refining Co., Arp	322
Central Refining Co., Friars Switch	S.D.
Constantin Refining Co., Overton	S.D.
East Texas Refining Co., Longview	5,048
East Texas Ref. Co., Friars Switch	4,617
Gladetex Refining Co., Gladewater	153
Gladewater Refining Co., Gladewater	123
Kilgore Refining Co., Kilgore	800
W. B. Mackey Ref. Co., Gladewater	263
Overton Refining Co., Overton	770
Rusk Refining Co., Overton	50
Sinclair Refining Co., Longview	1,317
Slack Refining Co., Camp Switch	S.D.
Southern Oil & Ref. Co., Reed Switch	500
Taylor Refining Co., Tyler	4,141

SHIPMENTS BY TANK CAR

Houston Oil Co., Kilgore	1,915
East Texas Refining Co., Longview	101
Cherokee Chief Ref. Co., Gladewater	718
F. & M. Transport Co., Camp Switch	315
Pilot Oil Co., Willow Springs	1,320
Tyler Pipe Line Co., Tyler	70
Total	4,445
Total daily average distribution	447,552
Total daily average production	419,440
Daily average from storage	28,110

EAST CENTRAL TEXAS WILDCATS

Week Ending November 9

ANDERSON COUNTY

Company, well, farm name, section and block—	Remarks:
H. B. McConnell et al's No. 1 N. B. Watson, 500 ft. from W line and 4,850 ft. from N of S line of survey in S half of 129-ac. tract, M. Main Sur.	Rig up and S.D.

BOWIE COUNTY

Tom Bell's No. 1 Merritt, 1,225 ft. from N and 875 ft. from E line of survey, T. S. McKinney Sur.	Coring 3,450 ft.
Logan and Elliott's No. 1 J. W. Smith, 9,600 ft. S and 2,500 ft. W of NE cor. of survey, Charles Lewis Sur.	S.D. 4,503 ft.
W. S. Langford's No. 1 W. W. Whybark, 200 ft. from S and W of SW cor. of J. A. Dyer Sur.	S.D. 1,860 ft.
Lee Timberlake et al's No. 2 Julius N. Tidwell, 655 ft. from E and 3,510 ft. from S of survey in L. M. Rice Sur.	S.W. on drill stem test; S.D. 3,012 ft.

CHEROKEE COUNTY

Bridges and Candler's No. 1 Berryman, center of Berryman tract, H. Kimble Sur.	S.D. 1,000 ft.
Denman et al's No. 1 Mrs. Renfroe, 330 ft. N of S line and 330 ft. E of W line of farm, Uriah Moore Sur.	Derrick.
Wilson & Stubbs' No. 1 L. Robart, 450 ft. from S and 150 ft. from W of lease, J. B. Wolfin Sur.	Fishing for drill stem 1,560 ft.

DALLAS COUNTY

Paris' No. 2 Wilkinson, 2,787 ft. from NW and 3,241 ft. from SW of John P. Anderson Sur.	T.D. 1,230 ft; S.D.
Joe Wilson's No. 1 fee, 600 ft. from N line and 600 ft. from W line of 1,500-ac. tract, John Scroggy Sur.	Derrick.

DELTA COUNTY

Worthington et al's No. 1 Pejernett, 776 ft. from S and 150 ft. from W in E. Chick Sur., 1½ miles W of Horton	S.D. 3,315 ft.

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COMPLETIONS IN EAST TEXAS

Gregg County

Adams & Lyle's No. 2 Anderson, top sand 3,485 feet, initial production 160 bbls. per hour through 1-inch tubing choke, total depth 3,498 feet. Alco Royalty Co.'s No. 1-A King, top sand 3,570 feet, initial production 150 bbls. per hour through various chokes, total depth 3,614 feet. R. A. Ambrose's No. 2 Green, top sand 3,574 feet, initial production 165 bbls. per hour through various chokes, total depth 3,601 feet.

Amerada Petroleum Corp.'s No. 1 Burnside, top sand 3,495 feet, initial production 160 bbls. per hour through open tubing, total depth 3,525 feet. Same corporation's No. 2 Freeman, top sand 3,686 feet, initial production 116 bbls. per hour through open tubing, total depth 3,732 feet. Same corporation's No. 2 Hearne, top sand 3,506 feet, initial production 100 bbls. per hour through open tubing, total depth 3,517 feet. Same corporation's No. 1 Tuttle, top sand 3,496 feet, initial production 160 bbls. per hour through open tubing, total depth 3,521

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Delaware Pool Found in Ward County

Oil Rises 800 Feet in Three Days Wildcat Has Been Shut Down. Good Well in Fisher. Increasing Activity in Ranger and North Texas

By L. E. Bredberg
Fort Worth Bureau, The Oil and Gas Journal

FORT WORTH, Tex., Nov. 9.—It now appears as if another county in the Permian Basin was to be benefited by the discovery of a Delaware sand pool, similar to the pool found in Loving County, approximately 13 miles farther to the north, and events of the last four days have quickened interest in Shipley & Byrd's test on the Monroe Ranch, in Section 3, Block 1, W. & N. W. survey, western Ward County, and the acreage in the neighborhood of this test, which is now standing shut down at 4,665 feet, 2 feet in the Delaware sand. Oil rose better than 400 feet in the first 24 hours, and 800 feet during the three days it has been shut down, the oil testing 32 gravity, or almost 10 degrees gravity less than oil found in the Loving Pool farther to the north.

The test is a rank wildcat in which D. H. Byrd of Dallas invested but a short time ago, taking it over to deepen from 4,549 feet, where it was shut down for some time. It topped the sand at minus 2,008 feet, or 43 feet higher than it was topped in the Denver Producing & Royalty Co.'s test 4 miles to the southwest, which was abandoned at a total depth of 4,703 feet. However, the sand in the Monroe test was topped around 450 feet lower than the average depth of the sand formation in the Wheat Pool.

There is but a small amount of gas in the Wheat Pool, as likewise in this test, and the wells are shot to increase the flow, consequently if this well does not flow when tested or drilled a little deeper it will probably be given a shot to increase its production.

Much of the acreage held in the immediate vicinity of the well is held by Shipley & Byrd, other offset acreage is held by the Pecos Valley Petroleum Co. and Denver Producing & Royalty Co. Other acreage in the neighborhood of the test is greatly cut up, and owned by many different parties.

The nearest pipe line outlet to the test is the Paso-Tex Pipe Line Co.'s 8-inch line from Winkler County to El Paso, which has a short connecting line to the Wheat Pool, taking oil from that area. In case production is obtained in the Monroe test, a short line may be laid to the T. & P. Railroad, about 8 miles to the south, near the town of Barstow.

Southwest Oil Producing Co. and Penn Oil Co.'s No. 1 Tubb in Section 3, Block 27-B, western Crane County, is not checking with the discovery well to the south, Cranfill Brothers and Gulf Production Co.'s No. 1 Tubb, which encountered water before it reached 3,700 feet. The former well is now drilling at 3,815 feet in hard lime, not yet encountering water. Another three or four days' drilling should give some interesting data on this well, proving whether it is to extend production to the northeast and open up a pool of major proportions in this part of the county, approximately 18 miles west of the Church-Fields and McElroy Pools.

Fisher County

Fisher County received another good well this week when the Texas Co.'s No. 1 Daniels, an east offset to the company's No. 1 Jean, topped the main pay at 3,091 feet, was drilled to 3,101 feet and flowed 87 bbls. of oil the first hour, making the best well in the Royston Pool. It is in Section 194, lock 1, B.BB.&C. survey in the northeastern part of the county. The Jean well was an extension to the Royston Pool, and flowed only 60 bbls per hour when it was completed at 3,205 feet. A south offset to No. 1 Jean, Cranfill & Reynolds' No. 1 George, missed the pay and drilled into sulphur water at 3,232 feet, drilling ahead at 3,380 feet. It is located in Section 200.

Two locations were staked in West Texas this week, one in Howard and one in Ward County.

North Texas and Panhandle

Activities are increasing in the Ranger and North Texas districts, these two districts showing 21 locations staked during the week. Two are in Brown County, 1 in Callahan, 1 in Coleman, 1 in Eastland, 4 in Shackelford, 3 in Archer, 7 in Young, 1 in Montague and 1 in Wichita County. One location was staked in Gray County in the Panhandle and one was staked in Moore County.

COMPLETIONS IN WEST TEXAS

Ward County

A. B. Bradford's No. 1 Carson, estimated 13,000,000 feet of gas from 2,145 feet, increase at 2,147 feet, initial production 5 bbls. oil per day and 5,450,000 feet of gas, total depth 2,195 feet.

COMPLETIONS IN PANHANDLE DISTRICT

Empire Gas & Fuel Oil Co.'s No. 1 Polling, gas 2,515-2,675 feet, 12,750,000 feet of gas, total depth 2,725 feet. Texoma Natural Gas Co.'s No. 1 McLaughlin, 40,000,000 feet of gas from 2,380-2,570 feet, total depth 2,575 feet. Lubbock Co. and Central Oil Co.'s No. 1 Bowles, dry and abandoned, total depth 4,171 feet.

WEST TEXAS PRODUCTION
Week Ending November 7

County—	No. wells	Prod.
Crane	377	16,433
Crockett	51	1,140
Ector	78	6,325
Fisher	78	947
Garza	2	0
Howard-Glasscock	544	26,017
Irion	9	63
Jones	87	1,402
Loving	46	3,70[illegible]
Mitchell	111	1,722
Pecos	551	66,844
Reagan	355	25,81[illegible]
Runnels	5	65
Scurry	5	0
Upton	263	4,519
Taylor	3	58
Ward	73	3,767
Winkler	595	36,436
Total production this week		195,257
Total production last week		195,182
Increase		75

COMPLETIONS IN RANGER DISTRICT

Coleman County

Continental Oil & Gas Co., Inc.'s No. 2 N. D. Newton, drilled deeper from 3,830 feet to 3,864 feet, initial production 200 bbls. flowing, old initial production 15,000,000 feet of gas. Same company's No. 5-A Newton, top pay 3,834-64 feet, initial production estimated 700 bbls., total depth 3,864 feet.

Callahan County

Kingwood and others' No. 1 Fowler, dry and abandoned, total depth 2,030 feet.

Eastland County

W. J. Felnsy's No. 1 Dunham, dry and abandoned, total depth 1,207 feet.

Palo Pinto County

Burton & McKee's No. 1 Strawn Coal Co., top pay 2,990-95 feet, initial production 12,600,000 feet of gas, total depth 2,995 feet. Gibson and others' No. 1 Pollard, top pay 2,980-81 feet, shot 20 quarts, initial production 14,000,000 feet of gas, total depth 2,998 feet.

Shackelford County

Wis-Tex Oil & Gas Co.'s No. 2 Goodwin, oil sand 1,959-69 feet, total depth 1,975 feet, plugged back to 1,969 feet, initial production 20 bbls. oil and 3 bbls. of water.

COMPLETIONS IN NORTH TEXAS

Archer County

Consolidated and Primrose Oil Co.'s No. 1 Wilson, dry and abandoned, total depth 2,315 feet. W. E. Norton's No. 1 Wilson, dry and abandoned, total depth 2,429 feet.

NORTH TEXAS PRODUCTION
Week Ending November 7

Panhandle district—	
Carson County	6,091
Gray County	45,078
Hutchinson County	13,950
Moore County	1,902
Wheeler County	460
Total production this week	67,481
Total production last week	65,037
Increase	2,444
Wichita Falls district—	
Archer County	12,703
Baylor County	630
Clay County	520
Cooke County	1,642
Foard County	70
Haskell County	26
Jack County	2,087
Montague County	3,603
Throckmorton County	500
Wichita County	18,057
Wilbarger County	13,396
Young County	12,475
Total production this week	65,709
Total production last week	67,005
Decrease	1,296
Ranger district—	
Brown County	3,086
Callahan County	1,590
Coleman County	2,226
Comanche County	762
Palo Pinto County	370
Eastland County	2,795
Shackelford County	3,372
Stephens County	4,387
Total production this week	18,588
Total production last week	18,830
Decrease	242

Wichita County

C. P. Sheldon's No. 1 Kinkerman, dry and abandoned, total depth 2,107 feet.

Young County

Beavers and others' No. 2 Belknap, oil

(Continued on Page 102)

WILDCAT OPERATIONS IN WEST TEXAS

Week Ending November 9

BREWSTER COUNTY

Company, well, farm name, section and block— Remarks:

Brewster Oil Co.'s No. 1 fee, 2,640 ft. S and 2,598 ft. E of NW cor. Sec. 45, Blk. G-15, G.C.&S.F. Sur. ....S.D. 1,935 ft.

E. L. Chapman's No. 1 Skinner, C SW SE Sec. 100, Blk. 2, G.C.&S.F. Sur. ....S.D. 1,302 ft.

Trans-Pecos Oil & Gas Co.'s No. 1 Jones, 930 ft. from N and 2,500 ft. from E of Sec. 18, Blk. G-15, G.C.& S.F. Sur. ....S.D. 2,900 ft.

Van McPhail's No. 1 McIntyre, SE cor. Sec. 59, Blk. 352, 7 miles south Alpine ....S.D. 1,750 ft.

COCHRAN COUNTY

Penn Oil Co.'s No. 1 Myrick, C Labour No. 80 of League 129, Carson County School Lands ....Drlg. 3,010 ft.

CONCHO COUNTY

Beesley et al's No. 1 Waring Estate, 400 ft. from N and E Sec. 163, T.&N.O. Sur. ....S.D.

Turner et al's No. 1 Borsig, 150 ft. from S of NE cor. G. Emmig Sur. 130, 6 miles W of Paint Rock ....S.D. 1,850 ft.

CRANE COUNTY

Southwest Oil Prod. Co. (Cranfill Bros.) and Penn Oil Co.'s No. 1 J. B. Tubb, 330 ft. from N and E of SW cor. of S 80 acres of NW cor. Sec. 3, Blk. B-27, P.S.L. Sur. ....Drlg. 3,742 ft.; slight show of oil 3,128-35 ft. and 3,445-55 ft.

CROCKETT COUNTY

Doleman & Moore's No. 1 Ferner 2,135 ft. from N and 1,485 ft. from E of Sec. 36, Blk. 2, I.&G.N. Sur. ....Spudded and S.D.

CULBERSON COUNTY

Kornrumpf et al's No. 1 Garren, 330 ft. S and W, Sec. 15, Blk. 79, Public School Land ....S.D. 1,300 ft.

DAWSON COUNTY

Albaugh et al's No. 1 Robinson, C NW Sec. 46, Blk. M, E.L.&R.R. Sur. ....To resume drilling.

ECTOR COUNTY

Weekly Oil Corp. et al's No. 1 Cowden, 1,980 ft. from N and W Sec. 33, Blk. 43, Twp. 2s, T.&P. Sur. ....Drlg. 1,350 ft.

(Continued on Page 105)

WILDCAT OPERATIONS IN TEXAS PANHANDLE

Week Ending November 9

CARSON COUNTY

Company, well, farm name, section and block— Remarks:

Magnolia Pet. Co.'s No. 1 Connell, 330 ft. N and E, SE, Sec. 66, Blk. 4, H.&G.N. Sur. ....S.D. 2,625 ft; T.P. 2,565 ft; 58,000,000 ft. gas.

Texhoma Nat. Gas Co.'s No. 1 Harrison, center NW, Sec. 40, Blk. 4, I.&G.N. Sur. ....Drlg. 2,250 ft.

Texhoma Nat. Gas Co.'s No. 1 Dover, 1,326 ft. from S, 656 ft. from W, Sec. 81, Blk. 4, I.&G.N. Sur. ....Set 8-in. csg. 2,180 ft.

Texhoma Nat. Gas Co.'s No. 2 Schaffer, center SE, Sec. 64, Blk. 4, I.&G.N. Sur. ....Drlg. 2,345 ft.

Texhoma Natural Gas Co.'s No. 3 Schaffer, center NW, Sec 63, Blk. 4, I.&G.N. Sur. ....Cellar.

Texhoma Natural Gas Co.'s No. 1 Urbanczyk, center NE, Sec. 4, Blk. 4, I.&G.N.. Sur. ....Spudding.

CHILDRESS COUNTY

C. L. Sloan et al's No. 1 B. P. Smith, Sec. 49, F. P. Knott lands ....T.D. 5,000 ft.

COLLINGSWORTH COUNTY

Dixon et al's No. 1 Bell, 330 ft. N, 1,320 ft. W, Sec. 102, Blk. 21, H.&G.N. Sur. ....S.D. 2,508 ft.

Downey et al's No. 1 Beasly, SE cor. SW SE, Sec. 95, Blk. 15, H.&G.N. Sur. ....Rigged up.

DEAF SMITH COUNTY

Western Union Oil Co.'s No. 1 Farwell, center NW, Sec. 18-3n-2e ....Rig.

GRAY COUNTY

Anderson et al's No. 2 Vollmert, 330 ft. N and W, SW, Sec. 140, Blk. 3, I.&G.N. Sur. ....Set 8-in. csg. 2,570 ft.

Back & Barber's No. 1 Back, 660 ft. from S and 330 ft. from W, Sec. 140, Blk. 3S, H.&G.N. Sur. ....Spudding.

Boyes et al's No. 1 Colebank-Morse, 330 ft. NE, Sec. 65, Blk. 3S, H.&G.N. Sur. ....Spudded and S.D.

Brown et al's No. 1 Duncan, 330 ft. S and E, NW, Sec. 93, Blk. 3, I.&G.N. Sur. ....S.D. 2,650 ft.

Dixon Creek Oil Co.'s No. 2 Horner, 330 ft. from N and E of Sec. 139, Blk. 3, I.&G.N. Sur. ....Rig.

(Continued on Page 105)

Pipe Line Construction News

OHIO OIL CO. PLANS LINES IN NORTHWEST

DENVER, Colo., Nov. 9.—Mountain States Oil & Gas Co. has entered an arrangement with Ohio Oil Co. whereby the latter takes over for development the Mountain States company's gas field holdings, covering 7,200 acres, in Weiser-Payette district of Idaho. Ohio Oil will immediately move drilling equipment into the field and start developing it to full capacity.

Ohio Oil is to furnish all money to develop the field and do all the work, and Mountain States company is to receive 40 per cent of all profits accruing. Ohio Oil also agrees that 75 per cent of all gas available from the field and purchased by that company must be Mountain States gas, and the two companies will arbitrate on the other 25 per cent as to whom and where it will be supplied.

William Scowcroft, president of Mountain States, expects Ohio Oil to hook up with its gas line, to be brought to Pocatello, Id., from its present terminal in Ogden, and that in the future it will extend its trunk lines to the Pacific Northwest. Ohio Oil, through subsidiary companies, is now supplying Ogden, Salt Lake and several other Utah towns and communities with natural gas from its Wyoming field.

Ohio Oil Co. has also secured 12,000 acres in southeastern Idaho from the Department of the Interior through oil and gas permits, but is not expected to test this area until after development of the Weiser-Payette Field.

Another petition for a certificate of convenience and necessity to render natural gas service in southwestern Idaho communities has been filed with the Public Utilities Commission, making the second now pending for the same territory.

The new petition was filed by H. H. Underhill, acting on behalf of the Interstate Finance Corp. The first was filed by R. J. Berry for the Ohio Oil Co. Both propose to transport gas from the Weiser Field and to serve Boise, Payette and several other municipalities.

In 1927 the commission granted a permit to the Idaho Petroleum Co. to supply natural gas to Payette, with the understanding that the distribution system should be in operation within two years. This has not been accomplished, according to the petition filed by Mr. Underhill.

The only manufactured gas competitor within the district is the Boise Gas Light & Coke Co., which serves only a part of Boise, the petition says.

The Ohio Oil Co.'s representative told the commission that his company plans to construct the pipe line from the Weiser Field to serve Idaho, Oregon, Washington, California and British Columbia.

MONTANA SPECULATING ON OREGON TRAIL LINE

Speculation in natural gas circles in Montana regarding the identity of the interests behind the International Utilities Corp. reported to have applied for permission to lay a 20-inch pipe line from Weiser, Idaho, paralleling the old Oregon Trail, to Portland, Ore., was increased by a statement in the Oregon Daily Journal that E. E. Lamb stated the International Utilities Corp. which he represents is an Idaho corporation and that he was financing a $30,000,000 bond issue through Harry M. Forest of New York.

Interviews with parties active in natural gas development in Montana so far have failed to disclose the principals in promoting the system, according to the Inland Oil Index which says there are plenty of rumors, however, one that L. B. (Tip) O'Neil might possibly be connected with a new proposition. Another is that the Montana Power Co. is in some way connected with the move. Those who believe the Montana Power Co. has a part in the proposition state that if the line is to start at Cut Bank it would be a very easy thing to run a line from Three Forks to Bozeman and thus connect northern Montana natural gas system with the southern Montana system, both of which are controlled by Montana Power.

The Montana Power has authorized the extension of its northern system to Three Forks but it has not yet been decided whether the line will be laid from Butte or from Helena to Three Forks. The line from Butte would be a few miles shorter, but would pass over the Continental Divide, a costly undertaking. The line from Helena would follow the Northern Pacific right of way down the Logan Valley through a comparatively easy country more densely populated.

With the north and south systems connected, the line could be extended southward from Dry Creek or Elk Basin to tap the reserves at Garland, Bryon, Little Buffalo Basin, and other structures in northern Wyoming and eventually it might be advisable to extend the line to central Wyoming for Pilot Butte, Muskrat, Powder River, and Pine Mountain. It might also mean a hook-up with the North Central and New York Oil Co.'s systems supplying Casper, Lander, Riverton, Douglas, and towns in eastern Wyoming and western Nebraska.

FOUR COMPANIES ASK NORTH DAKOTA GRANTS

BISMARK, N. D., Nov. 9.—Four companies have applied to the North Dakota railroad commisison for permits to lay natural gas pipe lines in this state. The Montana-Dakota Power Co., a subsidiary of the Minnesota-Northern Power Co. of Minneapolis, wants to lay a 100-mile extension from its Williston terminus to Minot and to operate distributing systems in municipalities and the territory adjacent to the line. This company wishes also to extend its line from Bismark farther eastward.

The Minot Gas Co., of Minot, N. D., has applied for a permit to lay a high pressure line from the Baker-Glendive Field, in Montana, to the town of Minot

North Dakota-Minnesota Pipe Line Co. of Fargo, N. D., wants a permit to construct a natural gas line between Kenmare and Minot, Minot and Grand Forks, and Meche, N. D., serving intermediate points.

E. J. Lamber, of Tulsa, has petitioned for authority to lay a natural gas line from the gas fields in the Mouse River loop area, Renville County, North Dakota, to the city limits of Minot, and to operate a natural gas distributing system in Sherwood, Lansford and Minot as well as other municipalities adjacent to the line.

If the Montana-Dakota Power Co. is granted permission for its extensions, it is probable the other companies will drop their plans.

PROPOSED NEW LINE IN EAST TEXAS AREA

AUSTIN, Tex., Nov. 9.—The Texas Royalty Owners & Producers Pipe Line Corp., with general headquarters at Tyler, has applied to John W. Martin, Texas blue sky commissioner, for permission to sell stock in a $4,750,000 company which proposes to construct a 12-inch pipe line from the East Texas oil field to Houston. Cost of the construction, a distance of 194 miles, was estimated to be $3,746,937.

T. B. Hoffer of Fort Worth is president of the corporation and a number of oil men are associated with him on the directorate.

HOCH WILL INTRODUCE NEW PIPE LINE BILL

WASHINGTON, D. C., Nov. 9.—Pipe line companies would be divorced from producing and refining companies and placed under regulation as transportation companies, under the provisions of a bill which Representative Hoch of Marion, Kans., a member of the house committee on interstate and foreign commerce, will introduce early in the coming session.

Such a measure was introduced by Mr. Hoch toward the close of the last session and brief hearings were held in committee, but the measure was not reported out. Mr. Hoch said, however, that he feels that with more time for hearings, so that the many advantages of the proposal can be brought out clearly, there is a good chance of its passage by the House.

"The fight for a tariff on oil will be vigorously continued during the approaching session," Mr. Hoch stated. "In addition to a tariff, I believe that the pipe line situation needs some major surgical operations. Pipe lines are common carriers and as such they should be confined to the business of transportation. They should be diverted from production, refining and marketing of the product they transport. The same law should be applied to them which was applied to the railroads some years ago when the railroads were getting control of the great coal fields in Pennsylvania and West Virginia. The railroads were forced by law to go out of the coal business. That was sound policy.

"In my judgment the control of pipe lines by great companies also engaged in producing, refining and marketing oil affords one of the most effective means for the destruction of the independent producers. As common carriers, the pipe lines are given the right of eminent domain, and other such public privileges. They should be limited solely to the transportation business, and as common carriers should be strictly regulated in the public interest."

WORK REPORTED BEGUN ON LINE TO LEWISTOWN

LEWISTOWN, Mont., Nov. 9.—The Lewistown Natural Gas Co. has started work on a natural gas line from Armells structure to Lewistown, Hanover, Moccasine, Moore, Judith Gap, and Harlowtown, Mont. The Skaggs Construction Co., Fort Worth, Tex., is doing the work. The line from the Armells structure to Lewistown and Hanover will be of 6-inch pipe, while the line from Hanover to Harlowtown and the towns en route will be of 4-inch pipe. The system will be over 100 miles long and will be in operation before winter.

The Moore interests also will construct a 30-mile natural gas line from the Arrow Creek structure in Montana to Coffee Creek, Denton and Stanford. Later a connecting line from Denton to Hanover may be laid.

The Communities Gas Service Corp., Republic Bank Bldg., Dallas, Tex., will take over operation of Montana system when it is completed.

The Communities Gas Service Corp. now maintain offices at Dallas, Tex., Kansas City, Mo., Lewistown, Mont.; Parsons, Kan., and Vernon, Tex. Recently the Parsons Pipe Line Co. and the St. Paul Gas Co. were acquired. A 12-mile line from the gas field outside of Chanute, Kans., to the town and a compressor station are now being constructed. C. O. Moore is president of the company, C. W. Hobson, chairman of the board, Homer R. Mitchell, vice president, J. H. Shelton, secretary-treasurer and C. M. Pierce, assistant treasurer.

ILLINOIS HAS CONTROL OF GAS LINE SYSTE

SPRINGFIELD, Ill., Nov. 9.—Th Panhandle Eastern Pipe Line Co. wi transfer all of its contracts with distri uting companies in this State to the Pa handle Illinois Pipe Line Co., a subsi iary, so that Illinois Commerce Commi sion may have unquestioned jurisdicti over the service, according to announc ment from the commission.

This action, it was stated, was prom ised by counsel following an informa conference at which the approval of ten porary experimental rates for natural ga service by the Illinois Power Co., ser ing Springfield, and the Central Illino Light Co., serving Peoria and vicinit was considered.

Counsel for the companies informe the commission they have virtually co pleted compliance with the commission order that certain construction and co data, requested by the League of Munic palities associated in the investigation rates to be charged for the proposed mi ture of natural and artificial gas.

The contracts for natural gas, it w explained, have been made between t Panhandle Eastern and the distributi companies. Various contracts also ha been made by the Missouri-Kansas Pi Line Co. with large industrial concerns

The commission urged the Panhand to "get all of its eggs into one basket" that the commission could keep control the sale of natural gas in Illinois a not see a portion of it held to be inte state commerce.

The commission expects the Panhand company to inform the commission as t rates it proposes to charge communiti where no gas utility service now exis and to justify these rates.

Counsel for the Panhandle company, i making request for temporary reduced e perimental rates, stated that with all o the data asked having been furnished cities which heretofore had objected t establishment of such rates have no changed their views.

COMPLETE WELDING LINE

The Welding Engineering Co. of Ba tlesville, Okla., announces that it ha completed the electric welding of 12 miles of 26-inch line for the Souther Fuel Co. of California. The total lengt of this line is approximately 202 mile each joint of which is welded. This i the largest solid welded large diamete gas line that has been completed to dat The electric welded section was complete 18 days ahead of schedule.

LINE TO NORBORNE, MO.

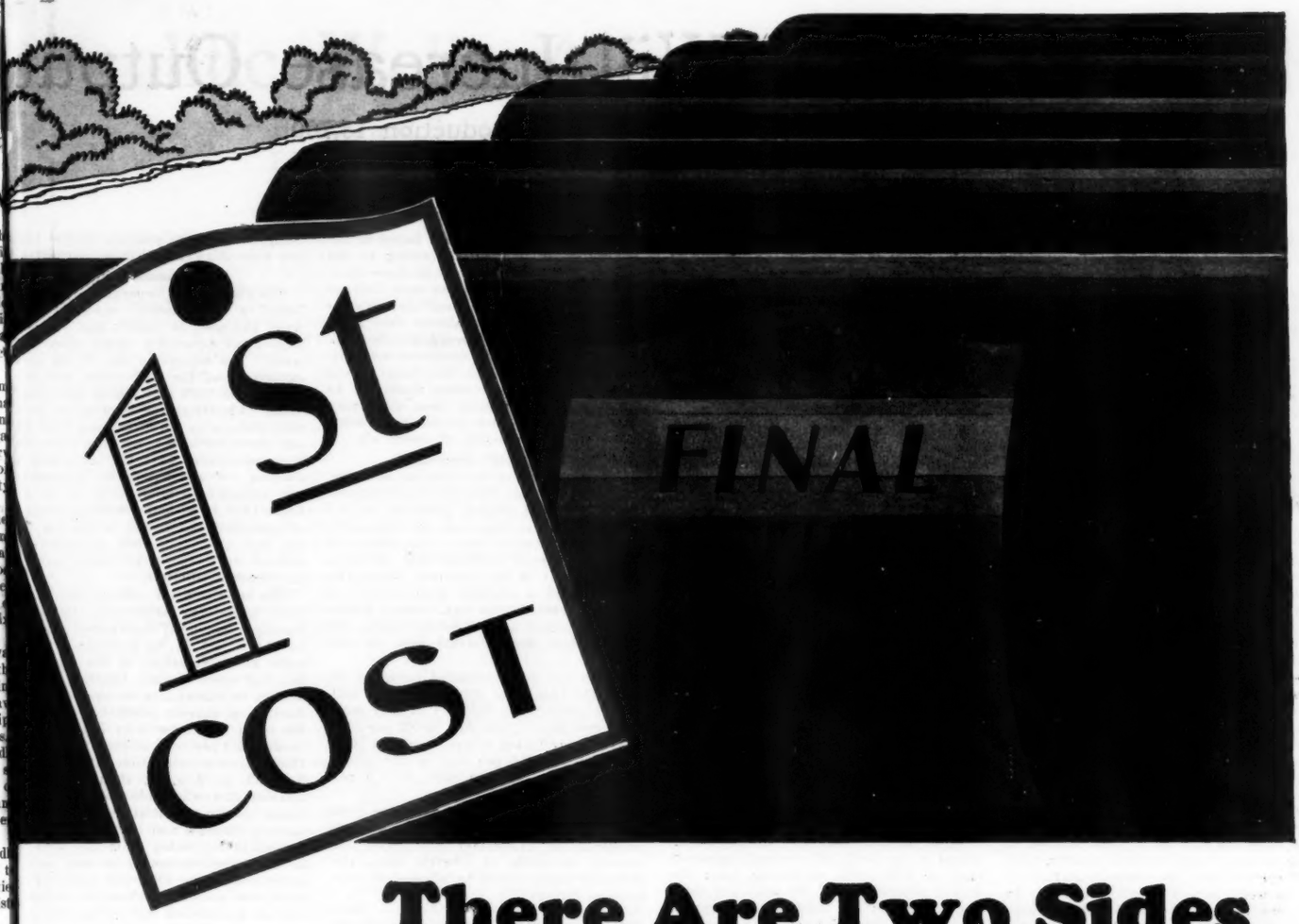
Natural gas has been turned into th mains at Norborne, Mo. The pipe line t serve Norborne was recently completed b the Cities Service Gas Co., the line ex tending to Norborne from a point jus south of Carrollton, Mo. The distribut ing system in Norborne was built by th Ozark Distributing Co.

SOUTH DAKOTA LINE

Fredell Construction Co. has construc tion work on the natural gas pipe lin from Dakota City to Sioux Falls i South Dakota about one-third complete The line is of 14-inch pipe and 90 mile long. It is being laid for the Norther Gas Engineering Corp., which is affili ated with the Missouri Pipe Line Co. I is expected that the work will be com pleted by November 15.

TO ENTER MEXICO

Extension of the San Diego Consoli dated Co. system is planned to Otay an San Ysidero, south of Chula Vista.



There Are Two Sides to a Price Tag

When the builders of the Inter-State, Empire, Denver, Memphis, St. Louis, Panhandle-Eastern and most of the other big oil and gas lines selected *Bitumastic Enamel*, they knew it would add to the cost of the line as compared with cheaper forms of protection.

But they also felt that their lines would be in good condition long after less adequately protected pipe had begun to show unmistakable depreciation. They knew that depending on soil conditions, the small difference in first cost might mean the difference between good condition and heavy depreciation in a few years of service.

They knew, in short, that there are two sides to pipe protection price tags and that only one side is shown by manufacturers who bank on price to book an order.

Seeing *both* sides of the question has led to the specification of *Bitumastic Enamel*, wholly or in part, for *most* of the big oil and gas lines laid in the United States.

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New Potentials Will Increase Output

Oklahoma Last Week Increased Its Production 15,700 Bbls. a Day. Leasing Town Lots in Capital City Continues

By W. A. Spinney
Staff Correspondent, Oklahoma Fields

With the two largest flush areas in Oklahoma, the Oklahoma City and the Greater Seminole area, taking new potentials, the State reports a substantial increase in daily average production. For the week ending November 7 production was 534,315 bbls., an increase of 15,700 bbls. over the previous week's gauges.

Revising of daily allowables of the wells in the Oklahoma City Field started Sunday morning with the umpire's staff classifying wells as to their producing horizons and figuring their permitted production under the new orders of the Corporation Commission.

Under the new order, permitting the wells in the Oklahoma City Field that are making water to produce more oil, some express the belief that the Silicious lime wells will be depleted in approximately two months, thus permitting the wells to be plugged back to the upper gas horizons.

A workable schedule has been devised for handling potentials in the Oklahoma City Field. Only a certain number of wells will be permitted to take potentials daily and the number of wells allotted to each company will be fixed ratably. This will prevent any one company getting all of its wells gauged ahead of others. In figuring the new potentials, the 24-hour basis has been dropped and the totals are computed on one-third of the total 24 hours' estimated potential.

New Orders Issued

The Oklahoma Corporation Commission issued new orders November 7, zoning the Oklahoma City Field in four producing horizons, giving the water wells a higher daily allowable percentage of the production from the field. The zones were defined in the order and the output of each zone changed. The commission's order is retroactive to November 1.

Allocating the allowable production from the Oklahoma City Field into four different sands with a different percentage for each zone, the commission's order did not change the daily allowable of 180,000 bbls. a day, but revised the proration order.

The daily allowable production from wells producing from the Silicious lime and the lower Simpson sand zones which have been making water were increased by allowing exemptions, in addition to the regular proration schedule. The total allowable of the field was held to 180,000 bbls. a day of which 18,000 bbls. a day was already allowed to the underproduced wells. The new allocation reduced the allowable of the nonwater wells from 5.4 per cent to 4.5 per cent of the potential. The order was made effective November 1, and remains in effect to January 1, 1932.

The order stated that there were four separate common sources of supply in the Oklahoma City Field, the Wilcox sand, the lower Simpson sand, the Silicious lime area, and the fault line area. The fault line area, the commission stated, was east of the other sources of supply and east of the fault in the field. The order also stated that each source is separated by an impervious stratum. It further stated that all wells in the Silicious lime area and many in the lower Simpson zone are showing water intrusion. The new order allows the wells in the Silicious lime area to produce 250 bbls. a day more than the allowable, which is approximately 8,500 bbls. a day in excess of the present allowable for these producers.

The Simpson sand zone, which was found to be showing considerable water was permitted to produce 200 bbls. a day in excess of the present allowable. The commission defined the water wells in the Simpson sand zone as those making less than 2,000 bbls. a day and making 3 per cent or less water, daily.

It is believed the total increased oil production from the wells showing water will be about 26,000 bbls. a day. This total substracted from the 162,000 bbls. which is the amount left after provisions have been made for the underproduced wells, leaves the nonwater wells a total of 136,000 bbls. a day.

Field Underproduced

The Corporation Commission recently held that the field was underproduced approximately 3,600,000 bbls. and allocated 18,000 bbls. a day to the underproduced wells, leaving a total of 162,000 bbls. to be produced from the other wells.

All three commissioners signed the new zoning order, which was asked by Wirt Franklin and others last May. This order is the first that has ever been issued zoning any oil field in the State.

The order further stated that there was no water intrusion on the Wilcox sand and fault line areas and the only change was a decrease in the allowable.

It is believed that of 844 wells completed in the field, 230 are making water. Out of 440 wells producing from the Lower Simpson sand, 80 wells are making water and the sand is in danger of destruction, the order stated.

The order also states that the Wilcox sand wells are endangered. Testimony taken before the commission shows conclusively that water encroachment in the Simpson sand and Silicious lime area has reached a stage where grave and serious damage already has resulted, when viewed from the standpoint of ultimate recovery from these two producing horizons.

It was further shown that unless some action is taken to prevent, further serious and irreparable damage will be done to these two horizons. It is also shown that the encroachment of water, as disclosed by evidence, even threatens the very prolific production found in the Wilcox sand, particularly owing to the fact that a number of wells have been drilled through the Wilcox sand horizon into lower sands which are now producing water. It is also shown that some of the wells when opened October 10, after the martial law shutdown was lifted, failed to produce anything except water and there is some doubt as to whether or not some of these wells may ever be brought back to the production of substantial amounts of crude oil.

"Potential" Decreases

A comparison of the present potential and the allowable with the April figures shows that the present potential is 11,550,000 bbls. a day, and the estimated November potential when completed will be approximately 9,000,000 bbls. Dividing the potential in the different zones, the Wilcox sand is credited with a total of 9,140,000 bbls. in one day. Lower Simpson is credited with 2,500,000 bbls. and the Silicious lime 160,000 bbls. in one day.

Under the new estimated potential of 9,000,000 bbls., the different zones will have a potential as follows: Wilcox sand, 7,380,000 bbls. in one day, or 82 per cent of the total; Lower Simpson sand, 1,500,000 bbls., or 16.6 per cent of the total; Silicious lime, 120,000 bbls., or 1.3 per cent of the total.

The rate of allowable production from the Oklahoma City Field under the old potential of 11,550,000 bbls., and the present allowable of 180,000 bbls., the different zones would be allowed to produce as follows:

		Bbls.
Wilcox sand,	.79×180,000	142,000
Lower Simpson,	.19×180,000	34,200
Silicious,	.02×180,000	3,600
Total		180,000

Under the basis of the same allowable, but using the new estimated potential of 9,000,000 bbls. a day, the production from the various zones would be:

		Bbls.
Wilcox sand,	.821×180,000	147,780
Lower Simpson,	.166×180,000	29,880
Silicious,	.013×180,000	2,340
Total		180,000

The new order considerably reduces the output from the Wilcox sand zone by permitting the Silicious lime and Lower Simpson zones to produce 26,000 bbls. a day more than the old order permitted.

Supplemental Order

The Oklahoma Corporation Commission issued a supplemental order during the week intended to clarify and correct its state-wide proration order issued last week. The correction was in the date of expiration of the new order, which was given as in 1931 and should have been in 1932. Clarifications applied to production charges in the Oklahoma City Field, and the order said it was the intention of the commission that the allowable production for the month of November of any otherwise eligible well in the Oklahoma City Field under said subparagraph of paragraph 13 should be limited to 5.4 per cent of its potential production, calculated on its potential taken after 7 a. m., October 10, 1931.

The supplemental order proceeds to say that while any otherwise eligible well having a potential determined after 7 a. m., April 1, 1931, in accordance with the rules and regulations of the commission, but not since 7 a.m., October 10, 1931, should be allowed to be opened for production of current allowable for November until November 5 at 7 a. m. not exceeding 5.4 per cent of such potential and that all such production after November 1, 1931, at 7 a. m. should be charged against the allowable for said month, based on the potential determined subsequently thereto, and that any production so had in November from any well prior to the determination of its new potential in excess of its allowable calculated on such new potential when determined, as well as production had during the taking of new potential, should be carried as permitted overproduction to be thereafter made up.

Taking New Potentials

Oklahoma City operators started taking new potentials on old wells Thursday, November 5, under the orders of the Corporation Commission. Between 70 and 80 wells a day were scheduled to take potential tests each day.

Permits for the taking of potentials in the Oklahoma City Field were signed by C. O. Rinson, W. N. Stokes and B. G. Patton, representatives of the Oklahoma Corporation Commission. Prior to this time the permits were signed by Lieut. Col. Cicero I. Murray, in charge of military proration.

Many believe the wells in the Wilcox sand horizon in the Oklahoma City Field will show a decline in the percentage since the April potentials were taken, it was indicated by the tests made of wells earlier in the week. Some of the wells are believed to have declined as much as 17 per cent in oil and 50 per cent in gas production. Wells producing in the lower Simpson horizon are believed to have had a smaller percentage decline in oil but a greater loss in gas volume.

Only about 200 wells have had new potential gauges up to November 7, and as the result of production on November 6, being 326,472 bbls. from 118 wells in 24 hours, hereafter only approximately 50 wells will be allowed to take potential gauges in any one day. With a daily production as large as that the gasoline plants were unable to handle the load of gas, it being estimated that 350,000,000 feet of gas was wasted. Extra precautions were also being taken to prevent a fire when the wells are being tested. Many of the wells are flowing for the first time since last July and two of these wells cut their connections Friday and were immediately shut in. Many of the wells flowed without chokes.

Production from the Oklahoma City

(Continued on Page 100)

WILDCAT OPERATIONS IN OKLAHOMA

NORTHERN OKLAHOMA

ALFALFA COUNTY

Company, farm and location—	Remarks:
Smith Brothers' No. 1 Forbes, SE cor. NW NW, Sec. 12-27-11w	S.D. 1,232 ft.
J. W. Bailey's No. 1 Acre, SW cor. NE Sec. 14-24-11w	S.D. 5,502 ft.

ATOKA COUNTY

Campbell's No. 1 Baird, NW NE SW Sec. 31-1-13	Rig.
Edgerton Edwards' No. 2 Rowland, SE NE NW Sec. 6-1-15	Rig.

BECKHAM COUNTY

Price-McFann's No. 1 Webster, C SW SW Sec. 34-8-26w	T.D. 2,344 ft; plugged back to 1,890-1,900 ft; 1,500,000 ft. gas.
Mid-Continent's No. 1 Schaff, C NE SW Sec. 22-11-22w	Waiting on cmt. to set 430 ft.
Mid-Texas Co.'s No. 1 Sidell, NE cor. SW SW Sec. 17-2-22w	S.D. 2,550 ft.
White et al's No. 1 Green, SW cor. Sec. 34-10-24w	S.D. 3,575 ft.

BLAINE COUNTY

Washoma Oil Co. et al's No. 1 Phillips, C NW SW Sec. 13-19-10w	S.D. 5,115 ft.

CADDO COUNTY

Abernathy & Brown's No. 2 Houston, Sec. 24-6-13w	S.D. 1,115 ft.

CHEROKEE COUNTY

La Fiore et al's No. 1 Woods, C SE SE Sec. 27-17-21	S.D. 1,185 ft.

COAL COUNTY

Radial Oil Co.'s No. 1 McCraw, NE NW Sec. 3-1s-8	Drlg. 1,165 ft.
McCraw Oil Co.'s No. 1 Ward, NE SE Sec. 35-1-8	Drlg. plug; showing 2,000,000 ft gas 1,765-1,846 ft; mudded off gas; S.D.
Whitney et al's No. 1 Miller, SE NE Sec. 10-2-8	S.D. 760 ft.

COMANCHE COUNTY

G. W. Stogner's No. 1 Doebel, C SW SW Sec. 3-3-9w	S.D. 1,450 ft.

LE FLORE COUNTY

H. E. Dowd et al's No. 1 Unknown, SE NE Sec. 17-3-22	Fishing 1,112 ft.

GARFIELD COUNTY

E. L. Love et al's No. 1 White, SE cor. NW Sec. 9-24-6w	S.D. 5,850 ft.

(Continued on Page 84)

Prolific Wells Along Ellsworth Arch

Barton and Stafford County Wells Now on Production, Pipe Line Outlets Having Been Supplied. New Commission Order

By W. A. Spinney
Staff Correspondent, Kansas Fields

Kansas' oil production was approaching its allowable of 110,000 bbls. a day, when the daily average for the week ending November 7, was approximately 106,250 bbls. It amounts to an increase of 3,500 bbls. a day over the previous week, caused by an increase in the allowable in the Ritz-Canton and Schurr Pools.

A revival of drilling has started in Sedgwick County where all tests are active. The operators are exploring the deeper formations in the Eastborough Pool. The area has been dormant for several months. Two new locations were announced during the week. The Derby Oil Co.'s No. 2 Eastborough, SE cor. SW NE, Section 19-27-2, will be drilled deeper from the chat formation to the Viola lime. Same company has located No. 7 Eastborough, a twin to No. 5, which was plugged back to the chat after losing the tools in the hole. Magnolia Petroleum Co. being forced to protect its line east of the Derby Oil Co. has made a location for No. 7, in the NW cor. SW NE, Section 19-27-2, a twin to No. 4.

The test in Barton County is being put on the pump, a pipe line outlet having been provided. Hilligoss and others on their No. 1 Isern, in Section 12-20-11w, were preparing to tube and pump the well which is estimated at 500 bbls. a day. The oil was found in the Silicious lime at 3,313-28 feet and is 47 degrees gravity, corrected. The Stanolind Crude Oil Purchasing Co. has built a 4-inch pipe line to the well, connecting with the Prairie Pipe Line Co.'s line near Raymond, a distance of about 4½ miles.

New wells in the Ritz-Canton Field include the sixtieth Viola well in the field. Olsen Drilling Co.'s No. 4 Koehn, NW cor. NE SW, Section 36-19-2w, found 2,000 feet of oil in the hole from the deep pay at 3,387-97 feet.

The chat production was extended to the north by Miller & Johnson's No. 1 McGill, SE cor. NW, Section 20-19-1w, which was flowing 4 bbls. of oil an hour from the chat at total depth of 2,994 feet. The gas was estimated at 2,000,000 feet a day.

Commission's New Order

In a move to hold down flush production in the State of Kansas, the Kansas Public Service Commission issued a new order limiting the drilling operations in four counties, Rice, Ellsworth, Barton and Stafford, where production is found in the Silicious lime, to one test on each 40 acres.

The order became effective November 4, and stated that all drilling in the Silicious lime areas would be limited to one well on each 40-acre square tract. The order was effective immediately pending a further hearing in the matter set for December 10 at Lyons.

Members of the commission said that the order would apply only in the four counties, where the commission was informed a competitive drilling campaign was imminent.

The order stated that the drilling restriction was designed to protect the oil-bearing sands in the area and to prevent underground waste. The drilling restrictions were recommended by the State's oil advisory committee, which in applying for the order said that the customary drilling of one well on each 10 acres would endanger the pools in the area and expressed belief extensive and rapid development would be harmful.

New Potential Gauges

L. R. Pickrell, umpire and agent for the Kansas Public Service Commission, has issued new potential gauges for the Schurr Pool in Rice County which total 10,761 bbls. a day from 12 wells, compared to 8,291 bbls. from 11 wells. One new well was added to the area during the last month and several of the other wells have been retested since the general field test for potentials was completed on October 18, which increases the potential production of the field approximately 2,500 bbls. a day. The present daily allowable of the pool is 20 per cent of the potential. The November daily allowable is set at 2,180 bbls. a day.

The new potential gauges by wells were as follows:

Company and well—	Pot. prod.	Daily allow.
Phillips Pet. Co., No. 1 Mesger..	1,377	275
Phillips Pet. Co., No. 2 Mesger..	1,247	249
Prod. & Refiners, No. 1 Thompson	689	138
Prod. & Refiners, No. 2 Thompson	981	196
Slick-Pryor-Lockhart, No. 1 Mesger	886	177
Slick - Pryor - Lockhart, No. 1 Schurr	742	148
Slick - Pryor - Lockhart, No. 2 Schurr	1,062	212
Slick - Pryor - Lockhart, No. 3 Schurr	1,300	260
Vickers Pet. Co., No. 1 Binger...	1,380	276
Vickers Pet. Co., No. 2 Binger...	347	69
Vickers Pet. Co., No. 3 Binger...	100	50
Total	10,761	2,180

There are some objections to the new state ruling limiting the drilling of new tests to one on each 40 acres in the central western part of the State. It is believed that several companies with acreage in the four counties may oppose the order at the final hearing which will be held at Lyons, in Rice County, on December 10, while it is believed that others will support the order.

The Public Service Commission acted unexpectedly and without any notice of its intentions. The new order was made effective at once, pending the hearing. The purpose of the order was to prevent waste. State authorities said they had been informed that a drilling campaign was to be started in Ellsworth, Rice, Stafford and Barton Counties. The members of the State's oil advisory committee stated that if unlimited drilling was permitted it might result in the pools being damaged by water. There are also several other subjects to be considered at the Lyons hearing.

The question as to the commission's authority to issue an order regulating the spacing of wells in the State is to be considered. The commission desired to hear the testimony of the land owners as well as that of the producers and decided to hold the hearing as near the field as possible.

Some of the producers express the opinion that by the continued practice of conservation in the central western part of the State, where it now appears the next big oil play will occur, the price structure can be maintained and there will be less danger from overproduction.

Barton County in Limelight

The finding of oil in Hilligoss and others' No. 1 Isern, SW cor. SE NE, Section 12-20-11w, in the southeastern part of Barton County, further indicates that the Ellsworth Arch will be productive. Since the well was completed a new lease and royalty campaign has developed. Before the test found oil companies in the area were releasing acreage and reducing rentals. About a year ago Stearns & Streeter Co. and Derby Oil Co. purchased from the State of Kansas, a lease on the river bed of the Arkansas River, which meanders through Township 20-11w, Barton County. The new well is located about a half mile from the river bed. If the river bed proves productive the State of Kansas will receive a one-eighth royalty from all the oil produced. The State has made several similar leases but only one has been productive up to the present time, it being north of Oxford in the Churchill Pool, in Sumner County, where eight producing wells were completed about five years ago.

Another wildcat test in Ellsworth County found water in the Silicious lime and was shut down. T. Palmer and others' No. 1 Phelan, SE cor., Section 2-17-10w, is shut down at 3,335 feet, where the water was filling the hole after finding a showing of oil at a shallower depth. The 8-inch casing was landed at 3,220 feet and the conglomerate was found at 3,272-82 feet where a showing of oil was found. Another oil showing was found at 3,300-05 feet. A 6-inch liner was set at 3,309 feet on top of the Silicious lime and another oil showing was found at 3,317-20 feet, and more oil at 3,327-32 feet, where the water started showing in the hole.

New Work Begun

The oil development in the State is mostly in the central counties along the Ellsworth Arch, in Ellsworth, Barton, Rice and Stafford Counties and in the western part of the State in Haskell County. The development of the gas possibilities in the western part of the State is expected to start by early spring. Recent new work in the central part of the State includes the following: M. R. Buck and others' No. 1 Jirik, SE cor. Section 10-16-10w, a rig; Derby Oil Co. and Aladdin Petroleum Co.'s No. 1 Stoltenberg, SE cor. SW NW Section 22-16-10w, preparing to spud; Williams & Moore's No. 1 Stratman, C SW SE Section 23-16-10w, landed surface casing at 200 feet; Barnsdall Oil Co.'s No. 1 Schacht, SE cor. NW SW Section 25-16-10w, a rig.

Western Kansas continues to be the most active area in the State from a development standpoint. The Mid-West Exploration Co.'s No. 1 Richardson, SE cor. Section 36-22-12w, a wildcat well in Stafford County, which was drilled and completed about a year ago, but was shut down until recently because of no pipe line outlet, was put on production making an average of 1,200 bbls. a day. The well was given a market outlet recently. The area surrounding the well is being unitized. The development calls for one well on each 40 acres, but in case the unitized plan is not acceptable a drilling campaign may start with the three offsets. The Mid-West Exploration Co. has 70 per cent of the acreage; Atlantic Oil Producing Co., 10 per cent; F. C. Harrington, 5 per cent; Sunray Oil Co., 5 per cent; J. A. Hull Co., 5 per cent; Eason Oil Co., 5 per cent. The acreage being unitized consists of N half Section 1-23-12w, all of Section 36-12-12w, W half Section 31-12-11w, NE Section 31-12-11w, totaling 1,600 acres.

The Slick, Pryor & Lockhart's No. 3 Schurr, NW cor. NE SW Section 21-20-10w, in the Schurr Pool, near Raymond, in Rice County, pumped 1,546 bbls. of oil in 23 hours and 15 minutes from the Silicious lime at 3,317-37 feet. The well was shut down 45 minutes during its 24-hour potential test.

Butler County

Flint Hill Oil & Gas Co.'s No. 2 Martin, CWL SW NE, Section 27-28-4, is drilling at 560 feet.

Cowley County

Brewer and others' No. 1 Brewer, SE cor. NW NE, Section 2-33-5, has drilled to 615 feet and shut down.

Ellis County

Mid-West Exploration Co.'s No. 36 Furthmeyer, SE cor., Section 25-12-16w, is rigging up to deepen from 3,108 feet.

Ellsworth County

Keys Brothers and others' No. 1 Gregory, SW cor., Section 23-16-9w, has been abandoned at 3,610 feet. Hinkle & Palmer and others' No. 1 Phelan, SE cor., Section 2-17-10w, is dry and abandoned at 3,344 feet.

Greenwood County

Empire Oil & Refining Co. made location for No. 1 Lewis, NE cor. SW SW, Section 9-24-12. Syndicate Oil & Gas Co.'s No. 7 Shook, NE cor. SW, Section 6-24-12, has been abandoned at 1,855 feet.

McPherson County

Rush Oil Co. and others' No. 2 Robinson, C NE SW, Section 10-19-2w, Ritz-Canton area, is a rig. Palmer, Phillips Petroleum Co. and Shell Petroleum Corp.'s No. 2 A. Winn, SE cor. NW, Section 7-20-1w, is a rig under construction. Derby Oil Co. and Gypsy Oil Co.'s No. 1 Sellers, SW cor. NW, Section 19-19-1w, has been completed for 542 bbls. potential on the pump, producing from Viola lime 3,404-22 feet. Shawver and Shell Petroleum Corp.'s No. 1 Lively, SW cor. NW,

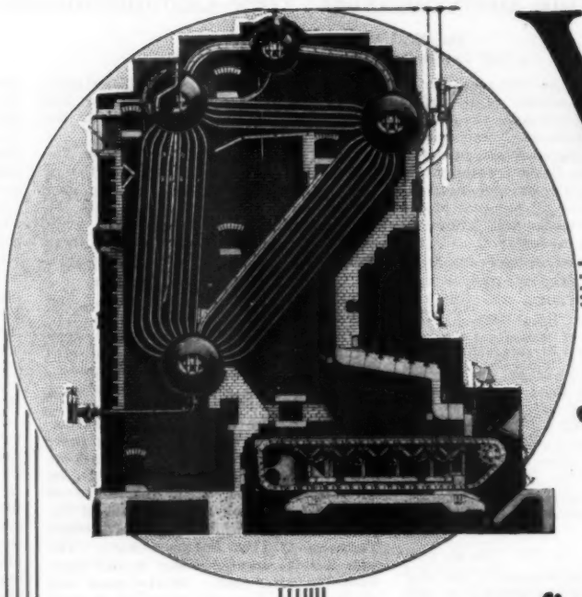
(Continued on Page 100)

WILDCAT OPERATIONS IN KANSAS

(Descriptions are West unless marked otherwise)

Company, farm and location—	Remarks:
BARTON COUNTY	
Syndicate Oil Co.'s No. 1 Boertz, NW SE SE, Sec. 13-13-12w	Drlg. 2,850 ft.
Skelton Oil Co.'s No. 1 Ott, C SE SE, Sec. 16-19-14w	S.D. 3,156 ft.
McCool et al's No. 1 Tsern, NW SE NE, Sec. 12-20-11w	Show oil 3,313-17 ft.; swabbed 540 bbls. 20 hrs.
CHASE COUNTY	
Borden et al's No. 1 Atkinson, NW SE, Sec. 18-18-7	Spudding.
CLAY COUNTY	
Crystal Oil et al's No. 1 Tivier, SW cor., Sec. 19-8-2	S.D. 2,700 ft.
COFFEY COUNTY	
Heyburg's No. 1 Kroft, SE SW SE, Sec. 30-22-14	T.D. 1,850 ft.; abandoned.
COWLEY COUNTY	
Slocum et al's No. 1 Union National Bank, C SW SW, Sec. 16-35-4	Drlg. 1,900 ft.
DICKINSON COUNTY	
Severs et al's No. 1 Lavengood, NE SW, Sec. 13-13-2	S.D. 4,546 ft.
ELLSWORTH COUNTY	
Keyes Bros.' No. 1 Gregory, SW cor., Sec. 23-16-9w	S.D. 3,610 ft.
Alyward et al's No. 1 Stratman, SE NW SE, Sec. 1-17-10w	Silicious 3,255-71 ft.; 117 bbls. 2 hrs.; shut in; estimated 2,000 bbls.; no pipe line connections.
Aladdin Pet.'s No. 1 Stoddenberg, C SW, Sec. 22-16-10w	Silicious lime 3,332-47 ft; estimated 1,500 bbls. a day; shut in.
FINNEY COUNTY	
National Ref. Co.'s No. 1 Wells, C SW, Sec. 13-23-30w	S.D. 1,610 ft.
FORD COUNTY	
Carter Oil Co.'s No. 1 Everett, C NE, Sec. 22-29-21w	T.P. 6,206 ft.; abnd.
GRAHAM COUNTY	
Schleimeyer et al's No. 1 Clark, SW NE NE, Sec. 11-9-25w	Abnd. 4,648 ft.
HARVEY COUNTY	
Liggett et al's No. 1 Davis, SW SE NE, Sec. 7-24-1	S.D. 1,505 ft.
J. P. Flannigan's No. 1 Sheridan, C SW, Sec. 22-22-1	Drlg. 3,760 ft.

(Continued on Page 84)



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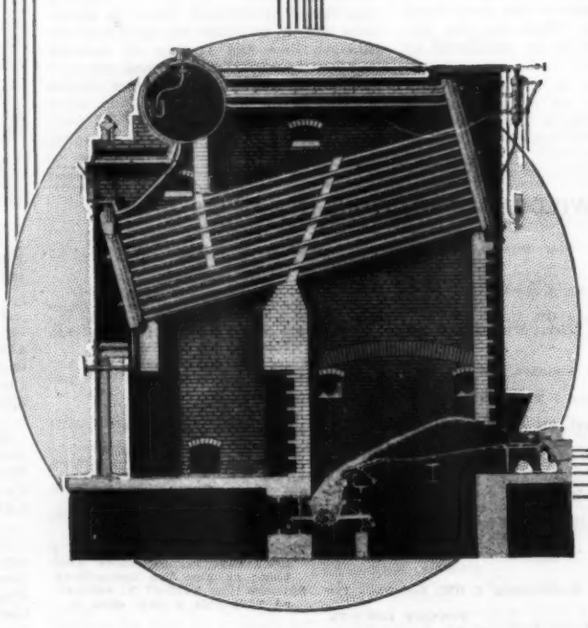

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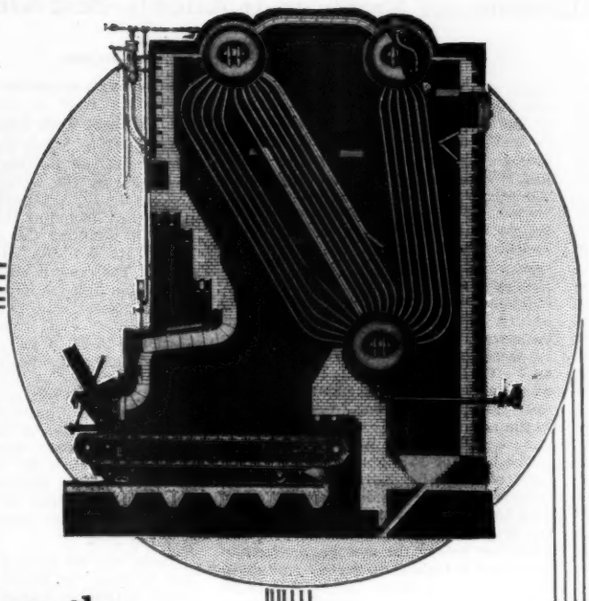

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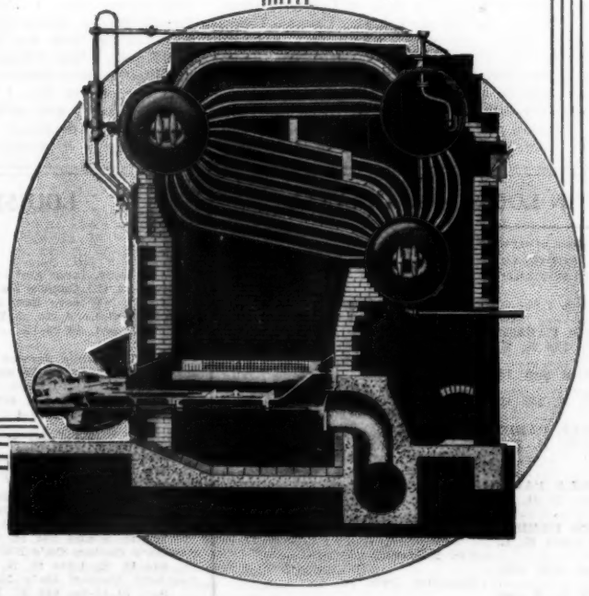

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Mississippi Test Encourages Operators

Although Gulf Refining Co.'s Completion in Clarke County Is Not Commercial Producer, It Affords Best Oil Show in State

By J. R. Crumpton
Staff Correspondent, Louisiana-Arkansas

SHREVEPORT, La., Nov. 9. — The Gulf Refining Co.'s wildcat in Clarke County, Mississippi, No. 1-A Long Bell Lumber Co., Section 10-2n-16e, was tested in the last week, and although the results were encouraging, it failed to make a commercial producer. With 8 feet of sand from 3,692-3,700 feet, the test developed 30 feet of oil with 50 feet of salt water and 30 feet of sand in the hole, which the sand pump failed to clean out after six hours of pumping. The oil tested 16.8 gravity and is coming from the upper Eutaw horizon, corresponding to the Blossom sand in North Louisiana. The crew has cored gray sandy shale from 3,725-81 feet, and probably will deepen to the Tuscaloosa horizon, the next likely producing formation.

Operators and followers of the test are pleased over the results as it is the best oil show yet obtained in Mississippi. The wildcat is located on a large block of acreage with a good geological structure and further explorations are expected.

With the exception of one pumper completed in the Ouachita County proven area of Arkansas, all of the other successful completions in the division were gas wells. The Richland Field of North Louisiana reported two good gassers after failing to appear on the completion list for several weeks. The Southern Carbon Co.'s No. 7 Rosengrant & Ducomb, Section 24-17-5e, had an initial flow of 12,434,400 feet of gas with 870 pounds rock pressure from 2,440 feet. The United Gas Public Service Co.'s No. 1 Faust, Section 13-17-5e, gauged 18,040,000 feet of dry gas and 850 pounds rock pressure from 2,425 feet. The Rankin County area of the Jackson Field in Mississippi reported the completion of Orr and others' No. 1 Casey with an estimated flow of 35,000,000 feet of dry gas from 2,378 feet. The new gasser is located in Section 12-5n-1e, which has recently been the most consistent and prolific area in the field.

Three wildcats were completed as dry holes, two in the border East Texas counties and one in Arkansas. In Cass County, the United North & South Production Co.'s No. 1-A Nickleberry, W. A. Irvin Survey, was abandoned at 4,145 feet. The test is located on a 6,000-acre block and was originally started to go to the Trinity horizon. Shelby County reported another failure with the abandonment of A. D. Smith's No. 1 Carroll, J. A. Parker Survey, at 3,240 feet. In Dallas County, Arkansas, the Zepp Oil & Gas Co.'s No. 2 Hillman, Section 20-10-13, was abandoned as dry in chalk at 2,688 feet. This is the second test in this immediate vicinity by these operators, the first well, listed as E. C. Brewers' No. 1 Hillman now stands as temporarily abandoned at 2,869 feet. Another location, No. 3 Hillman, in the same section, has been staked.

Crude Price Advanced

The boost of 15 cents per barrel in the price of crude for North Louisiana and Arkansas was received optimistically by operators and royalty owners throughout the division. The Standard Oil Co. of Louisiana posted the new price, effective November 4, making 40 gravity and above 85 cents with a 2-cent differential to 25 gravity. Below 25 is quoted at 53 cents. Heretofore the differential has been quoted down to 29 gravity. This new schedule was met by all major buyers except the Magnolia Petroleum Co., which posted a lower price for some of the major fields. This company quoted Bull Bayou at 83 cents, Haynesville 65 cents, Pine Island (Caddo), 73 cents, Cotton Valley 61 cents, El Dorado 63 cents, El Dorado East Field (Calion) 55 cents with Smackover carrying the same price posted by other companies, 55 cents. The Magnolia is the only company posting a price on Cotton Valley and the El Dorado East Field. The Louisiana Oil Refining Corp., in addition to meeting the Standard Oil Co.'s schedule, posted Urania crude at 55 cents, and Stephens, Ark., 29 and above at 54 cents, below 29 gravity at 51 cents. None of the companies posted Bellevue, shallow producing area of Bossier Parish, which remains shut down. Urbana, Union County, Arkansas, which was recently given a separate classification from Smackover, was not listed on the schedule. The new price range will add about $10,000 daily to the revenues from the combined fields, and in all probability will increase production in some of those areas where many pumpers have been closed in recently.

Arkansas Tests Closely Watched

Wildcats in North Louisiana and Arkansas did not develop anything of interest during the week. Three tests in Union County, Arkansas, are being closely watched, including the deep test of the Lion Oil Refining Co. in the Smackover Field. Its No. 9-A Hayes, Section 4-16-15. The crew is still coring rock salt which was first encountered at 5,974 feet with a present total depth of 6,085 feet. Joe Modisett and others' No. 1 Webb, Section 6-18-13, 3 miles east of Urbana production, cored sand from 2,513-32 feet. A drill stem test at this depth developed about 1,000,000 feet of gas with no oil, and the well will probably be deepened to the paying horizon of the Urbana Field, around 3,500 feet. The Drillers Oil & Development Co.'s No. 1 Pickering, Section 1-17-16, a semiwildcat in Union County, cored 5 feet of salt water sand to 2,134 feet after setting 6-inch casing at 2,128 feet.

Those who are looking for a connecting link between the Zwolle and Blue Lake Fields of Sabine Parish are not finding much encouragement from W. M. Coates' No. 1-A Bowman-Hicks, Section 18-7-13. This test set 6-inch casing at 2,169 feet, and tested dry at various depths and is now drilling at 2,500 feet, which is getting low for that area. The Loring Oil Co.'s deep test in the proven area, No. 18 Bowman-Hicks, Section 15-7-12, tested dry at 4,017 feet and is now drilling in lime and shale at 4,079 feet. Other drilling operations in North Louisiana follows: Bienville Parish, Arcadia Drilling Co.'s No. 1 Mason, Section 28-18-6, drilling in sandy shale at 1,370 feet; La Salle Parish. Gulf Refining Co.'s No. 1 Tremont Lumber Co., Section 10-9-2e, drilling in black shale and gumbo at 4,512 feet.

Shelby County

In Shelby County, East Texas, McRoby and others' No. 1 Windham, William Leach Survey, tested dry from 2,686-92 feet and the hole has been deepened to 2,704 feet. The Chapparel Oil Co. is building a new derrick and moving in new rig on its No. 1 Holt. Matthew Moore Survey, and will resume drilling from the old depth of 3,127 feet. The United North & South Production Co.'s No. 1 Windham, A. H. English Survey, is coring sandy shale at 2,682 feet, and Roy F. Smith's No. 1 Polley, Domingo Gonzales Survey, is trying to kill a flow of fresh water at 822 feet.

In Rankin County, Mississippi, two semiwildcats out of the proven area may make deep tests. The Gulf Refining Co. set 9-inch casing at 2,565 feet in its No. 1-A Hanna, Section 23-6n-1e, with a present total depth in chalk rock at 2,920 feet. The United Gas Public Service Co.'s No. 1-A McLaurin, Section 8-5n-2e, 3 miles east of the Rankin producing area, has passed up the regular paying horizon with a show of salt water and no gas. The total depth of the test is 3,000 feet in hard lime. The Square Deal Oil & Gas Co.'s test in Section 13-5n-1e, one-half mile southeast of production in Section 12, has set 4½-inch casing at 2,495 feet and will drill plug within the next few days.

Daily Average Runs

There was a net increase of 150 bbls. daily in the average runs from the fields of North Louisiana and Arkansas, the former gaining 165 bbls. daily while Arkansas decline 15 bbls. The daily average runs for the several pools were:

NORTH LOUISIANA	
Caddo, light	6,035
Caddo, heavy	1,580
Cotton Valley	320
DeSoto and Red River	2,170
Elm Grove	365
Haynesville	4,560
Holly	400
Homer	2,840
Pleasant Hill	245
Sarepta-Carterville	935
Urania	3,775
Zwolle	5,730
Total North Louisiana	29,055
Total previous week	28,890
Increase	165
ARKANSAS	
Champagnolle	2,120
El Dorado	3,250
Lisbon	590
Nevada	1,190
Smackover, light	3,080
Smackover, heavy	25,940
Stephens	665
Urbana	910
Total Arkansas	37,745
Total previous week	37,760
Decrease	15
Total both states	66,800
Total previous week	66,650
Increase	150

WILDCAT OPERATIONS IN LOUISIANA-ARKANSAS

(Rotary operations unless otherwise designated)

NORTH LOUISIANA

BIENVILLE PARISH

Company, farm and location— Remarks:

Arcadia Drlg. Co.'s No. 1 Mason, Sec. 28-18-6, 1,200 ft. W, 190 ft. N, SE cor. NE NW ..... Drlg. sandy shale 1,370 ft.

BOSSIER PARISH

Andrews & Davlin's No. 1 Nattin, 100 ft. N, 250 ft. W, C, Sec. 15-22-14 ..... S.D. 2,890 ft.

Dr. W. N. Hankin's No. 1 Newell, 300 ft. S and W, NE cor., Sec. 13-19-11 ..... S.D. 1,531 ft.

D. L. Perkins' No. 1 Ardis & Co., 1,127 ft. N, 198 ft. E, SW cor., Sec. 13-15-11 ..... S.D. 1,004 ft.

CALDWELL PARISH

Carter Bell's No. 1 Taylor, 150 ft. S, 150 ft. E, NW cor. NE SE, Sec. 17-14-4 ..... Set 12-in. csg. 110 ft.

Hudson et al's No. 1 Burton, Sec. 35-13-2e ..... S.D. 2,950 ft.

CATAHOULA PARISH

National Drlg. Co.'s No. 1 Marsh McMiller, 70 ft. N, 100 ft. W, C, Sec. 26-9-6 ..... T.A. 3,097 ft.

DE SOTO PARISH

Katchie O. & G. Co.'s No. 1 Hallie Smith (was H. E. Weichert's), NE SE, Sec. 31-14-15 ..... S.D. 2,350 ft.

Ben Merritt, tr.'s No. 1 Wallums, NE cor. SW SW, Sec. 19-13-12 ..... Reaming 2,840 ft.

M. T. Oakes' No. 1 R. H. Bryant et al, 300 ft. N and W, SE cor. NE NW, Sec. 30-13-15 ..... Drlg. lime 3,017 ft.

Rellitt Oil Co.'s No. 1 Ganno hrs., 300 ft. S and E, NW cor. NW NE, Sec. 12-11-16 ..... S.D. 1,965 ft.

Walters-Nicholson, tr.'s No. 1 Jim Guy, Sec. 2-11-13 .... S.D. 1,366 ft.

LA SALLE PARISH

Gulf Ref. Co.'s No. 1 Tremont Lbr. Co., 668 ft. N, 632 ft. E, SW cor., Sec. 10-9n-2e ..... Drlg. 4,512 ft.

NATCHITOCHES PARISH

Cooper et al's No. 2-A Cooper, C SE SE, Sec. 32-11-10 .. S.D. 1,518 ft.

(Continued on Page 91)

LOUISIANA-ARKANSAS PROVEN AREAS

NORTH LOUISIANA

CADDO PARISH—PINE ISLAND

Company, farm and location— Remarks:

Shreveport Oil Corp.'s No. 2-B Muslow, 1,000 ft. S, 300 ft. E, NW cor., Sec. 32-21-15 ..... S.D. 2,135 ft.

Simplex Oil Co.'s No. 1 Youree-Glassell, 500 ft. N and E, C, Sec. 13-20-15 ..... Tested S.W; S.O. 2,275 ft.

CADDO PARISH—RHODESSA AREA

United Gas Public Service Co.'s No. 1 H. J. Busse, Sec. 33-23-16, 990 ft. W and 660 ft. S of NE cor. ..... Drlg. lime 4,675 ft.

MOREHOUSE PARISH

Bahan & Bahan's No. 4 Feazel, 900 ft. W, 300 ft. S, NE cor., Sec. 2-20-4 ..... Location.

OUACHITA PARISH

Carbon Consolidated's No. 7 Guthrie, Sec. 50-20n-4e, 5,262 ft. N and 7,475 ft. W of cors. of Secs. 25, 26 and 49, in Sec. 50 ..... Location.

RICHLAND PARISH

Pelican Nat. Gas Co.'s No. 1 Alexander, Sec. 4-16-6, 660 ft. N and W, SE cor. Sec. ..... Drlg. 2,075 ft.

Southern Carbon Co.'s No. 1 Pollard, Sec. 26-16-5e, 2,-710 ft. S and 562 ft. W of NE cor. ..... Drlg. 2,316 ft.

Southern Carbon Co.'s No. 6 Rosengraut & Ducomb, 2,-640 ft. E, 1,980 ft. N, SW cor., Sec. 19-17-6 ..... Location.

Southern Carbon Co.'s No. 7 Rosengraut & Ducomb, Sec. 24-17-5e, 696 ft. W and 660 ft. S, NE cor. .... Comp. 12,500,000 ft. gas 2,440 ft.

Southern Carbon Co.'s No. 8 Rosengraut & Ducomb, 2,546 ft. E, 660 ft. N, SW cor., Sec. 18-17-6e ..... Rigging up.

United Gas Public Service Co.'s No. 5 Earle, Sec. 25-17-5e, 1,980 ft. E, 1,320 ft. S, NW cor. ..... Drlg. lime 2,402 ft.

United Gas Public Service Co.'s No. 1 Faust, Sec. 13-17-5e, 320 ft. W, 600 ft. N, SE cor. ..... Comp. 18,040,000 ft. gas 2,425 ft.

SABINE PARISH—ZWOLLE

O. J. Baird's No. 1 Duggan, Sec. 14-7-11, 325 ft. S, 648 ft. E, from center of Sec. ..... Drlg. 700 ft.

(Continued on Page 91)

Deep Sand Proved in Lockwood Field

One of Best Wells on Gulf Coast for Some Time. New Wells at Orchard and Nash. Mykawa Test Abandoned. Good Barbers Hill Well

By Neil Williams
Staff Correspondent, Gulf Coast Fields

HOUSTON, Tex., Nov. 9.—General advances in crude early the past week coupled with the trend toward greater activity have resulted in a decidedly more optimistic feeling throughout the Gulf Coast. While this is not taken to indicate that there will be a promiscuous and unnecessary increase in drilling and new work, operators in this area are almost unanimous in the belief there will be a steady improvement in conditions here to the end that additional coastal oil reserves might be built up.

Coincident with the price advances and better tone, developments on the coast the past week were marked by a noticeable increase in the number of completions. Scattered over various fields most of the new wells marked slight extensions of their respective pools although for the most part they indicated little more than the routine salt dome development.

Chief in significance among completions of the week was Cullen & West and Gulf Production Co.'s No. 2-A Lockwood & Sharp, Thompson (Lockwood) Field of eastern Fort Bend County. This well, which definitely proves up a deep sand on the north side of the field, is one of the best wells which have been brought in on the Gulf Coast in some time. With 136 feet of 4¾-inch screen set at a total depth of 5,151 feet, the well came in flowing initially 136 bbls. an hour through a three-quarter inch choke with pressure of 400 pounds. Three days later it still was flowing at the rate of 2,720 bbls. daily. Gravity of the oil is 25.2° (corrected), well temperature being 87°.

Completion of this well climaxes several attempts to make a satisfactory producer at this location. It is 800 feet north 20° west of No. 1-A Lockwood & Sharp, the discovery well, which was a producer in sand at a total depth of 3,087 feet. No. 2-A found that sand but at a total depth of 3,179 feet flowed only a small amount of oil and gas and quickly went to water. Drilled deeper, it found the deep sand. Tested at 5,103 feet, it flowed 8 bbls. hourly with unsatisfactory pressure and was deepened to its present depth.

Another Deep Well

Another deep well, No. 2 George, has been completed at this field. It is on the south side of the field nearly three-quarters of a mile. That well blew in two weeks ago without screen in the hole and flowed initially 27 bbls. hourly at a total depth slightly below 5,200 feet. The George well and the No. 2-A Lockwood & Sharp are the only two deep tests drilled but the same operators' No. 3-A Lockwood & Sharp, 600 feet of No. 2-A, now is drilling down to the sand found by the latter well after having failed also to make an oil well in the 3,100-foot sand. This well tested the sand at 3,107-39 feet and encountered high gas pressure. It also found sand at a total depth of 3,513 feet but tested salt water there and is being drilled deeper.

In the Thompson area, Gulf Production Co. has rigged up for No. 1 Mary D. Booth Meyers, a location 800 feet due north of Cullen & West's No. 2-A Lockwood & Sharp. Although acreage of Gulf Production and Cullen & West has been pooled on a 50-50 basis, the Meyers test is on a tract originally leased by Gulf and will be drilled by this company but with a Cullen & West rig. Previous development, which includes the discovery well, No. 1-A Lockwood & Sharp, Nos. 2-A and 3-A, three 3,500-foot producers, and the George deep well located a half mile southwest of the discovery well, has been by Cullen & West. The Gulf test will be of particular interest in view of its location 800 feet out from the field, in which the shallower sand development so far has proved of comparatively narrow extent. Cullen & West's No. 1-B Lockwood & Sharp, the most westerly of the 3,500-foot sand wells, a half mile southwest of the discovery well, stopped flowing late in the week and probably will be deepened in search of the deeper sands.

Barbers Hill

One additional good well was completed in the recently opened shallow sand play now going on along the east flank of the Barbers Hill Dome. This was Nat Hunter Producing Co.'s (Humphreys Corp.) No. 8-H Kirby, which flowed 1,872 bbls. the first 24 hours with 40 feet of 5-inch (O.D.) screen in sand at 4,379-4,401 feet. Production is through a five-eighths-inch choke. The Texas Company's No. 7 Wilburn, south offset to the 8-H Kirby, also is in the sand at 4,377-85 feet and has cemented casing to test. Sinclair Oil & Gas Co.'s No. 8 Wilburn is another of the series of new tests to reach the sand and is at a total depth of 4,494 feet preparing to test.

Orchard and Nash

New wells were completed at Orchard volume and pressure and at latest report and Nash Domes, where a small extension of productive territory was made at each. Both domes had been inactive for many months until the drilling of the present new wells which were started at the beginning of the present period of increased activity on the coast. At Orchard, Gulf Production Co.'s No. 30 Moore came in flowing at the rate of 1,200 bbls. daily through a half inch choke from sand at approximately 3,595 feet. The well is 400 feet north and 600 feet west of No. 29, the nearest production. These wells are in an unbroken line of production which Gulf Production Co. has been moving around the south flank of the dome. No. 30 is the first test drilled at Orchard since the completion of No. 29 late last May.

At Nash Dome, Harrison & Abercrombie's No. 15 Nash proved a slight extension out from the dome on the east side flowing initially at the rate of 1,200 bbls. daily with three joints of 6⅝-inch screen set at 4,844 feet. The well is 450 feet east, 75 feet south of No. 13 Nash, drilled by Rycade Oil Corp. However, like most previous Nash wells, this producer has shown a sharp decline both in was flowing 600 bbls. daily with pressure of from 60 to 110 pounds. Original pressure was around 325 pounds. Previous development at Nash has been by Rycade Oil Corp., which owned a half interest with Humble Oil & Refining Co. but with the dissolution of Rycade, Harrison & Abercrombie acquired that company's interest.

High Island

Yount Lee Oil Co.'s No. 22 Cade, northwest flank of High Island, Galveston County, has been completed in a sand at 5,133-65 feet flowing an estimated 400 bbls. daily. This is the second well completed by this company since its acquisition of the dome last spring. The new well is 125 feet south of No. 21 Cade, the first well drilled by this company.

Mykawa Failure

Humble Oil & Refining Co. has abandoned its No. 2 Irvin, Mykawa, Harris County. The hole was drilled to a total depth of 6,401 feet. The test originally was completed as a gas well in sand at 4,189 feet. Its abandonment marks another failure in the development of this torsion balance prospect, on which so far only small production has been obtained.

Yount Lee Oil Co. late in the week had drilled plug in its No. 10 Housierre-Latrielle, deep test on the southeast side of Jennings. Bottom of the hole is at 7,791 feet in sand and shale showing oil, which will be tested. If the test makes a well, it will be the deepest producer on the Gulf Coast. In the immediate vicinity, however, Yount Lee completed three wells in sand at 7,400-7,500 feet several years ago which have been the deepest production to date.

Jennings Petroleum Co. tested salt water in its No. 2 Eunice Crowley, also at Jennings, in sand at a total depth of 4,254 feet and now is pulling screen to deepen.

Manvel Well

The Texas Company's No. 1 Belcher, discovery well of Manvel, Brazoria County, still was flowing better than 750 bbls. daily at the close of the week following completion the preceding week flowing 1,000 bbls. daily. Production, however, was showing 8 per cent b.s. and water. Pinched to a seven-sixteenths-inch choke the well at latest report recorded pressure of 1,220 pounds on the liner and 250 pounds on the casing. Pressure has been building up steadily as it did following a previous completion of this well several weeks ago, and which resulted in killing the oil production. The well is in sand at a total depth of 5,494 feet.

Iowa and Cameron

Vacuum Oil Co.'s No. 1 Waite, discovery well of the Iowa Field, on the Calcasieu-Jefferson Davis Parish line, and its No. 2 Cameron Meadows, discovery well of the Cameron Meadows Field, Cameron Parish, still are shut in pending completion of facilities for handling and moving the oil. Magnolia Pipe Line Co., which will take the oil of both new fields, is building a wharf on Calcasieu River, 7½ miles from the Waite well, and is laying a small line to the field. From the wharf the oil will be barged to the Magnolia Petroleum Co.'s refinery at Beaumont. Cameron Meadows oil also will have to be barged out but at present only additional storage is being erected in that new field.

GULF COAST FIELDS AND WILDCATS

Week Ended November 7
All Rotary

BARBERS HILL—CHAMBERS COUNTY

Company, farm and location—	Remarks:
Mills Bennett Production Co.'s No. 1 Gulf fee, Henry Griffith League, 50 ft. out of NE cor., Strip 15	Drlg. 2,426 ft.
Mills Bennett Prod. Co.'s No. 6 Wilburn, Henry Griffith League, 125 ft. W of No. 5 in center of tr.	Drlg. 200 ft.
Mills Bennett Prod. Co.'s No. 5 Gulf-Fisher, Wm. Hodges Sur., 75 ft. from N line, 191 ft. W of No. 4	Rig.
R. E. Ferrell's No. 2 Wilburn, Henry Griffith League, 215 ft. W of No. 1 in center of 45-acre tract	Rig.
Gulf Prod. Co.'s No. 6 Wilburn, Henry Griffith League, 50 ft. from S line of lease and 400 ft. W of No. 3	Drlg. 1,112 ft.
Nat Hunter Prod. Co.'s No. 8-H Kirby, Henry Griffith League, 333 ft. W of No. 6-H Kirby and 70 ft. N of S line	Set 40 ft. 5-in. (O.D.) screen 4,401 ft.; comp. flowing 1,870 bbls. pipe line oil, 275 lbs., ⅝-in. choke.
Nat Hunter Prod. Co.'s No. 2 Tarbutton, Henry Griffith League, 385 ft. from E line and 21 ft. from N line of tract	T.D. 5,643 ft.; plugged to 5,250 ft.
Nat Hunter Prod. Co.'s No. 3-B Barber, Henry Griffith League, 538 ft. from E line, 70 ft. from S line of tract	Drlg. salt 2,502 ft.; top of salt 1,381 ft.
Nat Hunter Prod. Co.'s No. 1 S. E. Morgan, 225 ft. N of S line in center of Strip 2 (4.4 acres), Henry Griffith League	Cavity 876 ft.
Sinclair Oil & Gas Co.'s No. 8 Wilburn, Henry Griffith League, 350 ft. W of No. 7 and 48 ft. from N line of tract	Sand showing oil 4,494 ft.; cmtd. 9-in. csg. 4,440 ft.
Sinclair Oil & Gas Co.'s No. 9 Wilburn, Wm. Hodges Sur., 50 ft. N of S line and 550 ft. W of No. 6	Drlg. broken lime rock 1,226 ft.
Sinclair Oil & Gas Co.'s No. 10 Wilburn, Wm. Hodges Sur., 50 ft. S line, 100 ft. W of No. 9	Rig.
Sun Oil Co.'s No. 3 Smith (W.O.), W. D. Smith Sur.	Cutting and pulling screen to deepen 5,323 ft.
Sun Oil Co.'s No. 12 Wilburn, Wm. Hodges Sur., 50 ft. from N line and 75 ft. W of No. 11	Drlg. hard sand 1,073 ft.
The Texas Company's No. 7 Wilburn, Henry Griffith League, 116 ft. S of Humphreys Corp.'s No. 8-H Kirby	Sand showing oil 4,377-85 ft.; cmtd. csg. to test.
The Texas Company's No. 2 Lawrence, Henry Griffith League, 240 ft. from E line and 412 ft. from N and S lines of strip	Drlg. sandy shale 3,618 ft.

HUMBLE—HARRIS COUNTY

Southern Coastal Oil Co.'s No. 3 Perkins, John Jones Sur., 150 ft. N of No. 2	Derrick.
Sun Oil Co.'s No. 25 Bender, W. B. Adams Sur., 1,155 ft. from C of R.R. on an extension of the N line of the Bender North Addition and 8 ft. S	No report.
The Texas Company's No. 37 Koehler, J. B. Stevenson Sur., 717 ft. E and 602 ft. S of NW cor. of SW Fee tract	Drlg. gumbo and boulders 1,767 ft.
The Texas Company's No. 46 Stevenson fee, 1,630 ft. N and 1,690 ft. W of SE cor. of J. B. Stevenson Sur.	Drlg. gumbo and boulders 2,285 ft.

PORT NECHES—ORANGE COUNTY

The Texas Company's No. 1 Polk-Kuhn-Glass, 260 ft. E and 1,545 ft. S of SW cor. Marshall Beaucham Sur., in the T. J. Notgrass Sur.	Drlg. sticky shale 3,140 ft.
The Texas Company's No. 3 Kuhn, 587 ft. S and 150 ft. W of NE cor. of the Mary E. Hall Sur. No. 2	Location.

HULL—LIBERTY COUNTY

Republic Prod. Co.'s No. 144 Dolbear, Jesse Devore Sur., 350 ft. W of No. 97 and 200 ft. SW of No. 99	Drlg. 1,889 ft.
Wenecdan Oil Co.'s No. 2 Palmer, Chas. Underton Sur.	Shut down 3,110 ft.
Sun Oil Co.'s No. 10 Carr	Drlg. gum o 1,440 ft.

(Continued on Page 94)

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New Locations in Southwest Texas Area

Considerable Activity in Pettus District. Saxet Deep Test Abandoned. Wildcats Started in Several Counties

By B. D. Stevenson
Staff Correspondent, Southwest Texas Fields

SAN ANTONIO, Tex., Nov. 9.—Buchanan & Lefevre's (Buck Oil Corp.) No. 1 Ray at Pettus, the well that extended the new pool a half mile to the southwest, was being brought in the second time over the week end. The first time it started off like a 1,000-bbl. well but made some bottom hole salt water and has been plugged from 3,908 to 3,898 feet and was swabbing and cleaning itself late in the week and looks like a well. Final verdict on the well is due this week and results are still uncertain in the Saxet Field in Nueces County where Neal, Milton & Kepley whipstocked in the No. 1 Roark that made such a good showing on drill stem test but came in salt water after casing was set. Gulf Coast Oil Co.'s No. 1 Elder, 2½ miles west of it and in the same sand, was swabbing and showing some oil but also incomplete.

Proven fields in Southwest Texas the past week were devoid of any important completions. In the Laredo district the S.R.C. Oil Co. and Vacuum Oil Co.'s No. 5 Duval ranch lands at 1,737 feet was standing 1,400 feet of oil in the hole and going on the pump with probability it will make a 250-bbl. well, the third in that new pool in northwestern Duval County, and Cole Petroleum Co.'s No. 71 Benavides on the east edge of the Cole gas field in southwestern Duval County at 1,757 feet was standing 200 feet of oil in the hole and probably will make about a 100-bbl. well. It is the first test drilled since Cole discovered this new oil spot with his No. 70 Benavides a few weeks ago. No. 71 extends the production a little to the east.

Including a few new propositions for which locations are now being made but not finally staked out, there were about 20 new deals in Southwest Texas last week, 16 of them definite locations.

Pettus Area

Buchanan & Lefevre's No. 1 Ray has started considerable activity in that territory. J. M. Davis' (Damac) discovery well opened the pool, but the Buchanan & Lefevre test extended it a half mile and gave it acreage enough to make it important. J. M. Davis has now completed a block at the little town of Mineral, about 6 miles southwest of his discovery well, and is getting ready to drill it. In the meantime H. H. Weinert is down 2,300 feet on his test midway between the Damac discovery well and the Buchanan & Lefevre well and in another week should be on the sand at around 3,900 feet. C.R.M. is starting to offset Buchanan & Lefevre on the west.

Another line of activity is starting in Bee County around the Simms discovery gas field, 10 miles southwest of the Pettus townsite and 4½ miles due south of Mineral. Hughes and others have been rigged up for some time on a test about 1,000 feet south of the two Simms gas wells and now Al Buchanan is making a location on the Mary Dorenfield farm. Simms' No. 1 Holzmark came in at 3,552 feet for 56,000,000 feet of gas with about half a gallon of gasoline to the 1,000 feet of gas. No. 2 came in at 3,512 feet located about 1,000 feet northeast of No. 1, and made 45,000,000 feet of gas. It was drilled to a total of 4,458 feet and plugged back without getting anything in the lower formations. These two gassers were the first and only tests that have been drilled there. They were brought in late last year.

Saxet Field Activity

In the Saxet Field one deep test was abandoned the past week and two others are engaged in trying to make wells. Southern Drilling Co.'s (L. L. Smith) No. 1 Alexander was abandoned at 5,358 feet. It had salt water in sand at 4,872 feet, which corresponds to the sand that made such a good drill stem test showing in Neal, Milton & Kepley's No. 1 Roark.

No. 1 Roark, after proving that the salt water was not coming from the bottom of the hole, made other tests and finally whipstocked and was drilling down to the sand again and at 4,844 feet late in the week was coring sand thought to be the same as the 3,832-foot sand first encountered, the difference in footage being due to the fact that the second test runs off to one side.

In the meantime Gulf Coast Oil Co.'s No. 1 Elder, 2½ miles west of it, at 4,897 feet was swabbing and had shown some oil. It set casing without making a drill stem test. The swabbing was not completed as this was being written. Same company's No. 1 Sagarin, a little west of No. 1 Elder, was in a sand at 4,638 feet which showed a little oil. The week closed without anything definite from that field.

North of Nueces Bay in San Patricio County Saxet Oil Co. has started drilling No. 18 Rachel and is down 1,450 feet; and 15 miles north of that the Atlantic Oil Producing Co. has spudded in its No. 1 Welder in the F. R. Portillo Survey, about 2 miles southwest of Aransas Oil Corp.'s discovery gas well on the Welder ranch. Two other gas wells have since been completed in this new field by the Welder Oil Corp., the tests being near the discovery well and with production at an average of 3,650 feet.

Wildcat Showings

Thomas & Tarver, Inc.'s No. 1 Welder-Wood in northern Duval County, which recently had a showing of gas at close to 1,500 feet, but failed to make much, has deepened to 2,150 feet where it has a better showing. It is about 3 miles northwest of where William F. Morgan. Al Buchanan and some others drilled several tests a few years ago.

Another wildcat that looked promising for a small gasser was J. E. Anderson's No. 1 Suburban Irrigated Farms in the southwest corner of Bexar County, 20 miles southwest of San Antonio and about 7 miles north of the Somerset Field. At 1,135 feet it tested about 200,000 feet of gas with 160 pounds pressure and is starting to drill deeper in the hope of getting more pay formation and enough to make a good gas well.

Two of the three wildcats in Guadalupe County which are due to attract some attention have spudded in and the third is rigging up. M. W. Eiser's No. 1 Wells is rigging up. Pray and Campbell's No. 1 Kruger and Barnhill and others' No. 1 Hoffman have each spudded in.

Three other wildcats in the Beeville territory are getting started and are worth watching. Jacob, Buzzini & Pickett are starting a test north of the Calliham Field in northeastern McMullen County on the Jacob land and near some gas wells completed at shallow depth in the early days of the field. There have been no deep tests in that district.

Live Oak County

V. G. Schimmel is starting a test north of the town of Three Rivers in Live Oak County and a mile southwest of Fant City and Henderson Coquat and Phillips Petroleum Co. are starting No. 1 Sanger in southwestern Live Oak County about 2 miles from the west county line and 8 miles from the south county line. It is pure wildcat.

Out of the bunch of new propositions starting up the past week, C. J. Webster Oil & Gas Co. is starting No. 1 Adams in southeastern Medina County, where a structure has been proven by previous wildcats and the expectation is to bring in a gas field.

Camp and Stanolind will make another test in Goliad County northeast from the Pettus Field 15 miles where Neuhaus and Stanolind drilled No. 1 Pettus and at around 4,000 feet got a well making a little oil and considerable water. The second test drilled by Camp and Stanolind failed to get anything and location is being made for the third test.

In eastern Bexar County the unitized block is getting another test. It was unitized before drilling by a number of majors and independents and drilled for an Edwards lime field but failed in the Edwards though it made a well in the Taylor marl. One or two additional shallow Taylor marl wells were completed. Witherspoon Oil Co. secured a block of the acreage and added another producer or two some weeks ago and now has started developing again. Its No. 3 Ramzinski is down 1,372 feet and near the sand depth.

WILDCAT OPERATIONS IN SOUTHWEST TEXAS

ATASCOSA COUNTY

Company, farm and location—	Remarks:
Glen Mathis' No. 2 Mrs. C. Martin, 100 ft. SE of No. 1.	T.D. 2,980 ft; S.D.

BLANCO COUNTY

Hardy-Sitton's No. 1 McMillan	T.D. 602 ft; S.D.
Theo. Hicks' No. 1 Specht, 1,500 ft. from S line, 500 ft. from W line of farm, in Thomas M. Fowler Sur. No. 27 in extreme south point of county	T.D. 1,650 ft; drlg.
Lilee Adams et al's No. 1 Luders, 150 ft. to S line, 1,420 ft. to E line of James Stanford's No. 155	T.D. 1,100 ft; standing.
McCleary et al's No. 1 Schenling, 900 ft. to SE line, 600 ft. to S line of J. A. Rouse No. 118 Sur., 4 miles SW from Blanco City	T.D. 574 ft; S.D.
C. Rosenfield's No. 1 Hohenberger, 800 ft. to W line, 1,260 ft. to N line, Sur. No. 94	T.D. 712 ft; S.D.

BASTROP COUNTY

W. A. Allen's No. 1 Birmingham, Jas. Stewart Sur.	T.D. 1,215 ft.; dropped from reports.
Texas Dev. Co.'s No. 1 C. H. Ray, 800 ft. from W line and 400 ft. from S line of farm, in Thos. Christian Sur.	T.D. 2,090 ft.; drlg.

BELL COUNTY

Field & Lange's No. 1 Stubblefield, 450 ft. from S line and 150 ft. from E line of farm in Antonio Manchaca Sur.	T.D. 410 ft; drlg.
J. W. Riley's No. 1 W. S. Chaffin, in M. Griffin Sur.	T.D. 325 ft; drlg.
Jas. Scroggins' No. 2 Warrick, Ingram Sur.	T.D. 1,425 ft; drlg.

BEE COUNTY

Alexander et al's No. 1 McFall, 3 miles S Skidmore	T.D. 1,870 ft; standing.
Hughes et al's No. 1 Martin, 1,000 ft. S of Simms Oil Co.'s No. 1 Holzmark in John Lyford Sur.	Waiting on wtr.
Humble O. & R. Co.'s No. 1 Laura Thompson, 6,360 ft. from N line, 15,100 ft. from W line of tr. in Garrett Roache Sur., S part of county	T.D. 3,140 ft.; drlg.

BEXAR COUNTY

Callahan Final Oil Co.'s No. 1 R. H. Buck, 900 ft. to E line, 3,200 ft. to S line of farm, in J. M. McGamley Sur.	T.D. 80 ft.; drlg.
J. E. Anderson's No. 1 Suburban Irrigated Farms, 500 ft. to N line, 600 ft. to E line of C. Logan Sur.	T.D. 1,140 drlg.
Ingersoll-Miller's No. 2 Carruth, 3,900 ft. S, 2,500 ft. W of NE cor. of tr. in Francisco Bolen Sur.	T.D. 480 ft.

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SOUTHWEST TEXAS PROVEN AREAS

DOBROWOLSKI POOL—BEXAR COUNTY

Company, farm and location—	Remarks:
W. S. Rogers et al's No. 1 L. Donnop, Juan Montez Sur.	T.D. 612 ft.; abnd.
Gatlin Oil Co.'s No.9 Beck	Making location.
Whipple et al's No. 1 Gembler, 3,000 ft. to S line, 150 ft. to E line of A. Manchaca Sur.	T.D. 715 ft.; complete 1,000,000 ft. gas.
Williams et al's No. 2 Strunk, Juan Montez Sur.	Location.
Witherspoon Oil Co.'s No. 2 Ramzinski, 330 ft. to W line of tract, 660 ft. S of No. 1 Ramzinski	T.D. 1,372 ft.; drlg.

PETTUS POOL—BEE COUNTY

C. R. M. Drlg. Co.'s No. 1 Ray	Making location.
United Prod. Co.'s No. 39 Ray, 1,130 ft. to SE line, 2,396 ft. to SW line of T. Hanson Sur.	T.D. 6,809 ft.; drlg.
Buchanan & Lefevre's No. 1 Ray, 3,154 ft. from E line, 150 ft. from N line of Jno. W. Williamson Sur.	T.D. 3,908 ft.; swabbing.
H. H. Weinert's No. 1 Ray, 150 ft. N and E lines of lease in Jno. W. Williamson Sur.	T.D. 1,800 ft.
Houston Oil Co.'s No. 2 Portis, 330 ft. from N and W lines of A. Smalley Sur.	Rigging up.

BRUNER POOL—CALDWELL COUNTY

Joe Bruner's No. 1 Malone, 150 ft. to N line, 750 ft. to W line of tr., A. Floyd Sur.	T.D. 2,572 ft; set csg.; standing.

S.R.C.-VACUUM POOL—DUVAL COUNTY

S.R.C. and Vacuum Oil Co.'s No. 5 Duval Cattle Co., 150 ft. W, 330 ft. N of No. 1	T.D. 1,777 ft.; standing 1,400 ft. in oil.

SCHOOLFIELD-O'BYRNE POOL—DUVAL COUNTY

Humble O. & R. Co.'s No. 2 Paul White, 1,320 ft. to W line, 990 ft. to S line of Sur. No. 58	T.D. 2,297 ft.; set csg.
Magnolia Pet. Co.'s No. 6 Wilson, 330 ft. to E line, 2,346 ft. to N line of Sur. No. 136	T.D. 1,106 ft.; drlg.
Magnolia Pet. Co.'s No. 5 Wilson, 330 ft. from N line W line, 330 ft. from S line of Sur. 135	T.D. 2,316 ft.; set csg.

CAMP POOL—GUADALUPE COUNTY

John F. Camp's No. 1 Dan Denman, 150 ft. to N line, 450 ft. to E line of tr. in Wm. Arrington Sur.	T.D. 2,403 ft.; complete 1,330 bbls.
Humble O. & R. Co.'s No. 1 Dan Denman, 450 ft. to N line, 150 ft. to W line of lease in Wm. Arrington Sur.	T.D. 2,358 ft.; complete 5,460 bbls.
Humble Oil & Refining Co.'s No. 2-C Sue Denman, 900 ft. N, 450 ft. E of SW cor. of lease and 450 ft. N, 300 ft. E, 1-C, William Arrington Sur.	Building derrick.

(Continued on Page 95)

Northeast Colorado Holds Attention

Fort Morgan Dome Test Thought to Indicate Good Production. Greasewood Well Near Completion. New Locations in Eddy County, New Mexico

By Tolbert R. Ingram
Staff Correspondent, Rocky Mountain Area

DENVER, Colo., Nov. 9. — Increases of 10 to 15 cents per barrel in the price of crude in most of the Rocky Mountain fields had an encouraging effect on oil men and is expected to stimulate wildcatting.

The Reiter-Foster Oil Co.'s No. 1 Johnson-Juhl, half a mile west of production in the Greasewood Field in Colorado, is running a little low. Construction of a 15-car loading rack at Hardin and a 16-mile 4½-inch pipe line has been started by the Continental Oil Co. The Colorado Associated Oil Co.'s wildcat near Fort Morgan, which showed saturation in the core from the Dakota sand, made fast time in shipping, running and cementing pipe and is expected to drill in this week. One shallow test in Boulder County was dry. The Ohio Oil Co. is starting a deep test in Moffat County on the Craig Dome.

Flynn, Welch & Yates made two new locations in Eddy County, New Mexico, the Gypsy Oil Co. has a well in the Hobbs Pool ready for completion, and a small well of unusually high-grade crude in San Juan County, is flowing by heads.

The Kinney-Coastal Oil Co.'s No. 1 Chatterton-Weeis, on the Pilot Butte Dome in Wyoming, has increased its gas pressure from 80 pounds at the time of completion to 975 pounds and appears to be drilling itself in. A 10-bbl. well was completed in the Osage Field.

The Ohio Oil Co. made two locations in Montana, one on Dry Creek and the other on a wildcat structure, both in Carbon County. One dry hole was completed in the Kevin-Sunburst Field. The Prairie Oil & Gas Co. has suspended drilling on its Porcupine Dome test.

The Ohio Oil Co.'s test for gas near Payette, Idaho, is ready to drill into the objective.

COLORADO

Greasewood Area

The stage was all set for drilling in the Reiter-Foster Oil Co.'s No. 1 Johnson-Juhl, C SE SE Section 14-6n-61, on the Greasewood Dome in Weld County, half a mile west of the Continental Oil Co.'s No. 1 Briggs, the nearest producer, but the well still is an unknown quantity. The well is expected to throw some light on the trend of the structure as it is half a mile west of the other wells which run mostly in a north-south line. Its elevation is 4,671 feet, or 24 feet higher at the surface than No. 1 Briggs, half a mile to the east. The Briggs well topped the Muddy at 6,639 feet, which should put the sand on the Johnson-Juhl well at 6,663 feet, if it is at the same depth, based on structural elevation. It is now below that depth but the sand apparently has not yet been encountered, and the best geological advice available indicates it still has two or three feet to go. In spite of the uncertainty in regard to the situation, it is still believed that the well will be a producer.

Next to the No. 1 Johnson-Juhl, the well attracting most attention is the Continental Oil Co.'s No. 1 Gadbois, C SE SW Section 24-6n-61, half a mile to the south of the discovery and approximately a mile to the south of Johnson-Juhl well. It is bottomed at 6,593 feet and fishing for bit. The cable, all of which was in the hole, has been recovered and a hold on the tools secured. They were lifted a few feet, but are not coming out easily.

Outside of these two wells, there is no important change in the status of operations in the field. The Reiter-Foster Oil Co.'s No. 1 William Wilson, C NE SE Section 24-6n-61, is bottomed at 186 feet and waiting for rotary. E. L. Cobb's No. 1 Carlson, C SE SW Section 15-6n-61, is digging cellar and pits. The Greeley Oil Co.'s No. 1 Gadbois, C NW NW Section 25-6n-61, cemented 9⅝-inch at 5,550 feet with 700 sacks, using no ice, and is about ready to drill out plug. Frank E. Kistler & Co.'s No. 1 Niles, C SW SE Section 13-6n-61, has cellar and slush pits dug, but is waiting for the signing of the contract with the Platte Valley Petroleum Co., which company owns the lease. Independent Oil & Refining Co.'s No. 1 Schmidt, C NE NW Section 19-6n-60, has derrick up, and Tulsa-Fort Morgan Oil Co.'s No. 1 Smith, C SE NW Section 18-6n-60, is still a location. Aztec Corp.'s No. 1 State, C NE NE Section 16-6n-61, is standing with 15½-inch cemented at 100 feet.

The Continental Oil Co. has commenced construction of loading racks at Hardin, on the Union Pacific Railroad, 15 miles west of Orchard. It will accommodate 15 cars at a time. This point, while not quite as near to the field as Orchard, was selected because it is on the route of the projected pipe line from the field to Denver. The line will be constructed first to Hardin and will consist of 4½-inch pipe. It will be 16 miles long. Continuation of the line on to Denver probably will take place in the spring.

Weld County

Outside of the Greasewood area, the Prairie Oil & Gas Co.'s No. 1 O'Toole, C SE NE Section 33-7n-62, Crow Creek district, to the northwest of Greasewood, is rigging up and is almost ready to spud. Water will be taken from a Crow Creek underflow well for which line is now being laid.

Gulf States Oil Corp.'s No. 1 Bengston, C NW NW Section 6-4n-63, Box Elder district, still is a location. This well is on a tract that diagonally offsets a state lease held by the Gagan Land Co., but it is stated no effort has been made to acquire the offset tract.

Retter Oil Co.'s No. 1 Smith, C E half, Section 14-1n-66, Brighton-Lupton district, recovered the parted casing and set 12½-inch at 1,262 feet in broken shale and sand with a showing of rainbow colors and a little gas. It is drilling out plug.

Morgan County

The most important test now drilling in northeastern Colorado is Colorado Associated Oil Co.'s No. 1 Pumphrey, C SE SE Section 14-4n-58, on the North Fort Morgan Dome, which penetrated the Dakota sand, which was topped at a corrected depth of 5,836 feet, with a 2½-inch core barrel, to a depth of 15 feet, showing saturation of high gravity oil with gas in the upper two feet. The 8⅝-inch, special alloy seamless pipe weighing 44 pounds to the foot, was cemented at 5,815 feet with 200 sacks. The cement was run in six minutes and the wooden plug was at the bottom in 40 minutes. This well is 18 miles to the southeast of the Greasewood operation. The fact that saturation was found in the Dakota, which has not been tested at Greasewood, indicates that horizon will be the source of big production in that pool.

The Prairie Oil & Gas Co.'s No. 1 Mortier, C NE NW Section 2-5n-60, Jackson Lake area, cemented 9⅝-inch at 5,280 feet and is waiting. This well is between the Colorado Associated well and the Greasewood producers and on the trend of the major fold running in a northwest-southeast direction. It is running around 200 feet higher than the Greasewood wells, while the Colorado Associated well is nearly 800 feet higher. In between the Prairie and Colorado Associated well, the Magnolia Petroleum Co. has a big block which will prove very attractive territory in the event these two wells come in as producers. Magnolia has several large blocks in northeastern Colorado.

Indian Territory Illuminating Oil Co.'s No. 1 State, C NE NE Section 16-1n-57, south of Fort Morgan, is bottomed at 5,905 feet, corrected depth, and is milling on bottom.

William Myers and others' No. 1 Lee & Lusby, C NE SW Section 6-2n-56, Roundtop Dome, is waiting after pouring derrick foundations.

The Fort Morgan Oil Co. has a block of 19,160 acres immediately north of the Colorado Associated block. This acreage is to be tested shortly, but the beginning of actual operations is being held up by two or three holes in the block which it is desired to fill in before work is started. This block is especially interesting on account of its location. The geological work was done by John H. Wilson, consulting geologist, and checked by Dr. R. D. George, of the geological department of the University of Colorado. Doctor George, also, is vice president of the Fort Morgan Oil Co. While the map has not been made public, it shows three anticlines coming together near the center of the block. These are the Pawnee Creek anticline running from near the center of Township 9n, Range 56w south to Stoneham and then bending a little to the southwest; the Fort Morgan anticline, which trends in a northwest direction; and the Wildcat Creek anticline to the northeast of the Greasewood fold. The Magnolia Petroleum Co. has blocks both to the east and west of this block.

Badger Creek Oil & Gas Co.'s No. 1 Kent, SW cor. Section 2-2n-57, Badger Creek, is drilling at 1,340 feet with 600 feet of water in the hole.

Adams County

Hills Dome Lease Development's No. 1 Hills, SE cor. Section 27-3s-64, near Watkins, is drilling at 3,745 feet and lowering 8⅝-inch.

Arapahoe County

MacDeb Drilling Co.'s No. 1 Fitzsimmons, NE Section 7-4s-66, near Aurora, is drilling at 5,811 feet. The 4¾-inch is on the ground and has not been run as heretofore reported.

Elbert County

J. M. Botts' No. 1 Buick, SE cor. Section 1-8s-59, is standing at 3,500 feet with 12½-inch at 2,000 feet. This operation has been idle for some time, but it was reported recently a deal is pending for its completion.

Belmont Oil Co.'s No. 1 Maher, SE NE SW Section 4-6s-59, Deer Trail, is shut down at 3,720 feet with the 6⅝-inch on bottom. Several offers to finance the completion of this well are reported to have been made the company, but on terms it was unwilling to accept. It has had several good shows of oil.

Lincoln County

Eastern Colorado Oil Co.'s No. 1 State, SE cor. NW Section 36-14s-57, near Hugo, is bottomed at 3,425 feet and fishing for tools.

Jefferson County

Ruby Hill Oil & Gas Co.'s No. 1 Braden, SE cor. Section 24-4s-69, is bottomed at 4,100 feet and circulating to lower 6⅝-inch.

Park County

South Park Oil Co.'s No. 1 Milligan, NE cor. SE Section 13-8s-76, near Jefferson, is bottomed at 2,605 feet and cleaning out and lowering 6⅝-inch, and South Park Oil & Gas Co.'s No. 1 Esche, SE cor. NW Section 5-9s-76, is shut down at 2,465 feet.

La Plata County

Phipps and others' No. 1, SW NW Section 9-33n-13w, Dry Mesa, an operation not heretofore reported, is drilling at 470 feet in a 12½-inch hole with the Dakota as the objective. J. W. Irwin & Co.'s No. 1 Doescher, SW cor. NW Section 29-33-13, is coring at 3,140 feet in the Dakota sand with a slight show of oil.

Rio Blanco County

The California Co.'s No. 1 California-Raven, NW SE Section 30-2n-102, Rangely Dome, is drilling at 2,900 feet. Magnolia Petroleum Co.'s No. 1 Maddock, C NW SE Section 9-2s-96, Piceance Creek, is drilling at 1,804 feet.

Moffat County

The Ohio Oil Co. has made a location for its No. 1 Bogenschultz, C SE Section 9-6n-91, Craig Dome, 3 miles southwest of Craig, and is moving in rig used in drilling the Powder Wash discovery in the northern part of the county. This is to be a rotary test for gas. The company has been granted a franchise by the town of Craig. The lease upon which the test is to be drilled was turned to the Ohio company by the Midwest Refining Co. The gas sand found in the Morgas formation at Bell Rock is expected at 3,000 feet.

Larimer County

Raddatz Corp.'s No. 2 Fagin, SE cor. NE Section 17-4n-69, is drilling below 300 feet. Same firm's No. 2 State, SW cor. NW Section 16-4n-69, is bottomed at 3,780 feet in the Muddy sand, which is saturated, and is running pipe to drill a little deeper.

Mayer Oil Co.'s No. 1 Reed, SW cor. NW Section 28-4n-69, Berthoud Dome, is underreaming 6⅝-inch at 2,400 feet and will carry this string down to the Nio-Benton at 3,100 feet.

Maupin and others' No. 1 Meade, SW SE Section 17-4-69, has completed water well and is preparing to resume at 740 feet.

Boulder County

Julius Williams' No. 1 Degge, NE SE SE Section 6-1n-71, Boulder Arch, is drilling at 362 feet, and C. T. Ahlstrand's No. 1 Woodley, SE NE NW Section 8-3n-70, Lyons district, is drilling at 501 feet.

Independent Oil & Refining Co.'s No. 1 Blair-Winter, NW cor. Section 25-3n-71, was abandoned at 200 feet. It had some gas, but it was not commercial.

NEW MEXICO

Lea County

In the Hobbs area, in Lea County, where drilling operations in the county are now centered, Gypsy Oil Co.'s No. 1 East Grimes, SW NE SE Section 33-18-38, is bottomed at 3,949 feet, where 7-inch was set, and is waiting for cement to harden. This will be the first completion in the pool for several months.

Midwest Refining Co.'s No. 26 State, NW SE SE Section 33-18-38, is drilling at 2,040 feet in salt and streaks of anhydrite, and its No. 8 Byers, SE NW NW Section 3-19-38, has cellar and pits completed.

Continental Oil Co.'s No. 4-B State, NE NW SE Section 33-18-38, is drilling at 2,815 feet, and its No. 5-A State, C NW SE Section 33-18-38, spudded to 145 feet with machine and is changing over to rotary.

Pacific Coast Oil Co.'s No. 1 Blakey, C SW NW Section 28-19-38, to the southwest of the Hobbs Pool, completed cellar and pits and is shut down waiting for orders.

Eddy County

Flynn, Welch & Yates made two locations in their No. 62 State, NW cor. SE Section 10-19-28, Artesia area, which is moving in materials, and No. 1 State (Paul) NE cor. SE Section 26-20-27, in the south Artesia area and southwest of the Getty Pool. Flynn, Welch & Yates No. 61 State, SE NE NW Section 35-

(Continued on Page 101)

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A. S. M. E. Code Construction	
Nominal Horsepower	100
Working Pressure	250 #
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Heighth Overall	10′ 9½″
Width Overall	61″
Length Fire Box	84″
Heighth Fire Box	65″
Width Fire Box	51″
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Length Tubes	10′ 6″
Weight of Boiler	23,000 #

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Further Improvement in California

Many Smaller Refiners Paying Premiums for Crude. Refined Market Shows No Substantial Change. State Potential Reduced

By L. P. Stockman
Staff Correspondent, California Fields

LOS ANGELES, Calif., Nov. 7.—The past week witnessed a further improvement in the crude situation in California although no substantial change in the refined market is evident. Spot oil has practically ceased to exist and many smaller refiners have been paying substantial premiums to secure additional crude to meet current requirements. One substantial sale was made early this week on the basis of 50 cents per barrel above the posted price and similar purchases are pending. Even this substantial premium is not productive of any deluge of offers to sell as there is very little oil available, most producers being under contract to various refiners on a time basis. Recent developments indicate a strong probability that the production situation in California will show a further tightening during the next two or three weeks.

The operators committee on statewide curtailment reduced California's potential daily production 44,500 bbls. effective November 1, the new potential being 1,031,500 bbls. per day, compared with the previous potential of 1,076,000 bbls. No change was made in the maximum allowable daily production which remains pegged at 487,500 bbls. during the remainder of the year. The potential daily production of Long Beach was cut from 130,000 bbls. to 109,100 bbls. and the allowable reduced from 72,000 bbls. per day to 71,000 bbls. Potential production of Santa Fe Springs was cut from 119,000 bbls. to 112,950 bbls., although no change was made in the daily allotment of the field, which remains at 53,500 bbls. Potential of Kern Front was reduced from 16,270 bbls. to 15,950 bbls., Kettleman Hills from 192,000 bbls. to 190,300 bbls., Elwood from 30,150 bbls. to 29,000 bbls., Ventura Avenue from 92,900 bbls. to 91,175 bbls., Brea Olinda from 23,670 bbls. to 20,090 bbls., Dominguez from 17,050 bbls. to 15,050 bbls., Huntington Beach from 44,450 bbls. to 43,550 bbls., and Inglewood from 21,290 bbls. to 19,650 bbls. per day. Playa Del Rey, one of the few fields to register increased potential, was boosted from 35,930 bbls. per day to 36,430 bbls. No change was made in the maximum daily allotment of Kern Front, Kettleman Hills, Midway-Sunset, Round Mountain, Elwood, Ventura Avenue, Brea Olinda, Dominguez, Huntington Beach, Inglewood or Playa Del Rey.

Ventura Avenue

The Associated Oil Co. chalked up a new completion in the Ventura Avenue Field early in the week when No. 18 on the Ventura Land & Water Co. lease was brought in flowing 1,525 bbls. of 28.1 gravity oil and 2,200,000 feet of natural gas per day from an even 7,000 feet, the hole having been finished with a 6⅝-inch liner landed at 6,986 feet. On the McGonigle lease the Associated recompleted No. 9 on a compressor doing 110 bbls. per day from 7,099 feet. There are still four or five potential producers scheduled for early completion in Ventura Avenue and they should be tanking oil within 30 days. The deep zone discovered by the Associated Oil Co. several months ago is not expected to become a factor of consequence for at least another year, as operators are refraining from deep zone exploitation. The Shell is drilling a deep test to determine the potentiality of this zone, after which the well will be shut in. The Bolsa Chica Oil Co. is also drilling a deep test and work will be resumed on this hole within the next few days at 4,430 feet, where a string of 13⅜-inch pipe was cemented last week. No. 6 Hartman of the Bolsa Chica is being drilled by the Superior Oil Co. An oversized 132-foot derrick and extra heavy drilling equipment is being used. The rig and equipment is quite similar to equipment used by the Superior Oil Co. with considerable success in the North Dome at Kettleman Hills.

Elwood

With the restoration of normal conditions in the Elwood Field of Santa Barbara County due to the decision of operators to retard deep zone exploitation, daily production of this field can be expected to remain slightly below the maximum allowable during the course of the next several months. For a short time it looked as though the Barnsdall and Rio Grande's discovery of a new deep zone might precipitate a competitive deepening campaign but this was avoided when the discovery well was shut in and other operators ceased preparations to exploit the new zone. In the short space of a week or 10 days Elwood operators have begun considering the advisability of unit development in place of competitive drilling which would ultimately ensue under ordinarly conditions when this zone is opened for development. There are one or two wells drilling in the Elwood Field but all of these will be completed in the present productive Vaqueros zone and not the recently discovered Sespe horizon.

Fruitvale

The Fruitvale Field of Kern County, discovered a few years ago by the Western Gulf Oil Co., is scheduled to show a revival of drilling, although any production resulting is not expected to be adversely reflected in the existing curtailment program. This new drilling, which will be somewhat of a competitive nature due to small individual holdings, is already under way. It is believed that approximately 10 or 15 new wells will be started within the next few weeks. Some of this work may possibly be prevented if subsequent development reveals the inability to secure commercial production due to edgewater condition or the lack of sufficient gas pressure to result in a natural flow. Drilling operations now getting under way at Fruitvale are the result of a quitclaim on 80 acres filed by the Western Gulf Oil Co. The Gulf originally held 160 acres under lease in this particular section but recently decided to quitclaim one-half of its holdings. The 160 acres were subdivided into 5-acre tracts several years ago and it is these 5-acre units which will sustain this new development. The Gulf will naturally be obliged to offset several of these new wells but its holdings are more favorably located with respect to structure and will consequently justify offsetting. Al Jorgensen, Mohawk Oil Co., Plymouth Oil Co. and the Sea Hawk Petroleum Co. have already started work on one or more new holes.

Kettleman Hills

The Kettleman Hills Field showed further indication of its enormous potentiality when the Kettleman North Dome Association increased its list of producers a few days ago. Drilling operations have shown a consistent decline although two or three new wells are being rigged up for early work. The North American Consolidated is again making hole in No. 1 Blauvelt in Section 36-21-17, following a delay of several weeks because of mechanical trouble. Top of the upper variegated shale was logged in this hole at 8,898 feet, the deepest point at which this marker has been found in the Kettleman Hills Field up to the present time. In the Middle Dome the Petroleum Securities is coring ahead in No. 1 Burbank at 8,800 feet, the present formation being a hard greenish gray sand showing no cut or odor. This well has reached the critical stage as over 1,230 feet of Temblor has already been drilled through without finding any evidence of the so-called black oil sand.

The Kettleman North Dome Association brought in an exceptionally good well this week when No. 4-28 J was completed flowing at the rate of 1,000 bbls. an hour. It was beaned back and this afternoon it was clocked at the rate of 8,933 bbls. of 36.0 gravity oil and 22,693,000 feet of gas daily from 8,397 feet. The oil is clean and has a cut of 2.4 per cent. The Association also expects to bring in its No. 25-28 J within a few days and from all indications this well will be about on a par with its No. 4-28 J. The Standard Oil Co. has had more hard luck at Kettleman with its No. 65-29 J. They will be forced to have another squeeze job as a leak was detected in the casing with intermediate salt water coming in and a cement job is therefore necessary.

Lost Hills-Belridge

The General Petroleum Co. is making slow footage in its No. 1 Berry in the Belridge Field of Kern County, Section 30-28-21. The well is drilling in a brown shale at 7,169 feet. The Belridge Oil Co. has reached approximately 6,700 feet in its No. 64-27 in Section 27-27-20. In the Lost Hills Field of Kern County the General Petroleum Corp. has suspended operations on its No. 1,301 in Section 13-26-20. It was redrilled to 4,145 feet and plugged back from 3,550 to 3,147 feet. It is the intention to have this well remain idle pending further developments. The 4½-inch casing was recemented at 5,228 feet in the Lincoln Petroleum Co.'s No. 1-A Theta in Section 12-26-20 and the well cleaned out 6 feet below the shoe and bailed to 3,500 feet. There was no rise in the fluid and the water shutoff appeared to be satisfactory. The hole is being cleaned out and bailed by 10-foot stages. The company will make another swabbing test provided there is no further sign of water. On the Kern Front the Chanslor-Canfield Midway Oil Co. had a satisfactory water shutoff in its No. 39 in Section 23-28-27 and is drilling at 1,891 feet. In the Round Mountain Field of Kern County the Range Oil Co.'s No. 1 in Section 36-28-28 is standing re-cemented for the fourth time at 3,790 feet. In the Semitropic district of Kern County the Fullerton Oil Co. is now down 300 feet in its Core Hole in Section 25-27-23.

Long Beach

In the Long Beach Field, Combs & Weaver completed a new well early in the week when their No. 3 was finished at a depth of 6,784 feet and put on the pump doing 75 bbls. of 26.8 gravity oil. Dabney and Johnston also put their No. 74 on the pump and it made 65 bbls. of 29.6 gravity oil daily from a depth of 8,000 feet. There was not much drilling activity in the Long Beach Field and only one new location was staked, E. J. Preston's No. 34. In the Rosecrans Field the Woolner Oil Co. has taken over Elbe Oil & Land Co.'s No. 3 and is making repairs to the rig before deepening. In the Dominguez Field the Shell Oil Co. is drilling out the cement in No. 40 Reyes now at 3,825 feet. The company is drilling ahead in its No. 41 at 1,050 feet. The Union Oil Co. got a satisfactory water shutoff in its No. 25 Callender at 4,577 feet. It has killed No. 27 on the same lease preparatory to deepening. A rig has been erected for No. 17 on the company's Hellman property. In the West Coyote district the Standard Oil Co. is making good footage in its three wells, Nos. 108, 109 and 110, all nearing the 3,000-foot level. In the Inglewood Field the Baldwin Hills Syndicate is building a derrick for its deep well, No. 1 Sentous. This lease is on property offsetting Standard Oil Co.'s Nos. 45 and 46 Los Angeles Investment on the southwest side just south of the Vickers leases. Much interest is manifested in this deep test as Pan American Petroleum Co. drilled several wells in this section down to the present producing horizon with negative results.

Huntington Beach

Further drilling has been stopped in the Superior Oil Co.'s No. 1 Elbe, a deep test drilled to 9,054 feet in the Huntington Beach Field, and the lower portion of the hole is being abandoned. The bottom

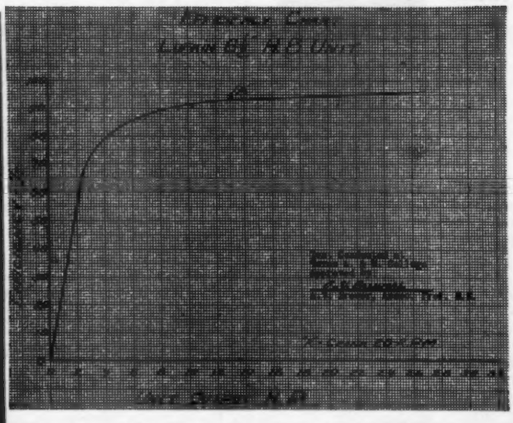
TANKER SHIPMENTS FROM LOS ANGELES TO ATLANTIC AND GULF COAST PORTS

Commodity—	Total this week	Daily average	Total last week	Daily average	This year to date	Same time last year
Crude oil	.....	.....	.....	.....	.....	68,690
Fuel oil	.....	.....	.....	.....	.....	71,950
Diesel and gas oil	.....	.....	93,310	17,770	1,473,198	3,034,162
Gasoline	115,620	16,517	72,398	10,743	11,447,682	16,645,237
Kerosene	.....	.....	.....	.....	187,934	.....
Coastwise—						
Crude oil	268,788	38,398	485,578	69,368	18,407,171	13,465,045
Fuel oil	288,438	41,205	255,659	36,526	11,074,575	15,064,323
Diesel and gas oil	39,650	5,664	15,490	2,213	1,290,105	1,440,688
Gasoline	427,711	61,102	239,097	34,157	12,058,660	10,635,750
Kerosene	13,336	1,905	13,140	1,877	280,718	151,436
Naphtha distillates	.....	.....	.....	.....	4,952	.....
Exports—						
Crude oil	156,428	22,347	138,617	19,802	6,169,870	5,843,670
Fuel oil	473,992	67,713	250,571	35,796	11,637,977	14,993,964
Diesel and gas oil	61,805	8,829	151,097	21,585	3,977,746	3,866,676
Gasoline	317,818	45,403	5,042	720	7,424,557	13,792,649
Kerosene	.....	.....	.....	.....	1,396,048	3,085,709
Lubricants	.....	.....	.....	.....	36,353	27,434

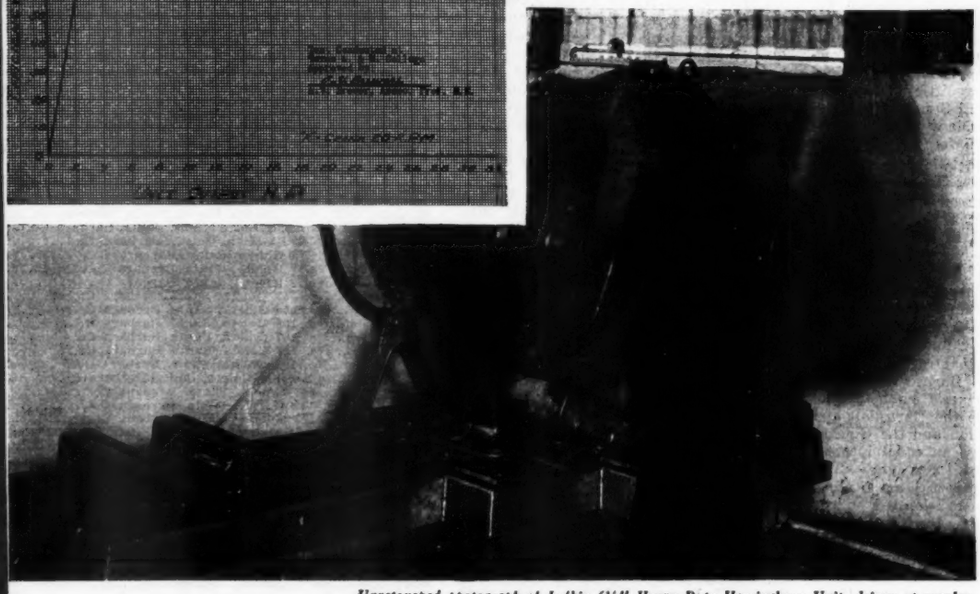
TANKER SHIPMENTS FROM SAN FRANCISCO TO ATLANTIC AND GULF COAST PORTS

Diesel and gas oil	.....	.....	.....	.....	.....	279,088
Gasoline	.....	.....	.....	.....	883,929	1,080,671
Lubricants	.....	.....	.....	.....	35,236	27,796
Coastwise—						
Fuel oil	101,709	14,530	58,061	8,294	3,030,748	2,750,552
Diesel and gas oil	.....	.....	4,259	608	350,919	310,222
Gasoline	154,466	22,067	93,529	13,361	3,892,562	3,721,276
Kerosene	12,950	1,850	7,130	1,019	279,174	194,883
Naphtha distillate	.....	.....	.....	.....	49,780	.....
Exports—						
Crude oil	80,502	11,500	60,657	8,665	410,751	59,993
Fuel oil	.....	.....	62,881	8,983	1,348,607	866,296
Diesel and gas oil	.....	.....	.....	.....	482,708	457,589
Gasoline	138,231	19,747	70,175	10,025	3,895,536	3,571,126
Kerosene	18,590	2,656	.....	.....	302,322	570,271
Lubricants	.....	.....	.....	.....	25,692	33,579

No friction here!



Efficiency chart of Lufkin 6½" Heavy Duty Herringbone Unit—result of test conducted at the A. & M. College of Texas under the supervision of A. V. Brewer, Associate Professor of Engineering. *Lufkin units are 98.9 to 99.44% efficient.*



Unretouched photograph of Lufkin 6½" Heavy Duty Herringbone Unit, driven at regular speed of 22 strokes per minute, by a ½ H. P. motor. Certainly no friction here!

With Ease A-Plenty—This Half Horse Power Motor Propels Heavy Duty Lufkin Unit At Regular Pumping Speed

Lufkin — Hyatt equipped — friction-free, Sykes-Herringbone Units are 98.9 to 99.44% efficient, according to test conducted in the laboratory of the A. & M. College of Texas. Efficiency chart on test conducted reproduced above.

Such an attained efficiency, coupled with the highest degree of workmanship and of materials conforming to our own rigid specifications, assures the user long, efficient life and economy in operating and maintenance costs.

Without obligation, Lufkin Engineers will gladly recommend the correct Lufkin Installation for your lease. *Request this cost-free service today!*

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was plugged with 100 sacks of cement and a plug placed at the shoe of the 9-inch casing at 7,177 feet. Showings evidently did not justify further deepening at this time. Although it was reported gas was in evidence, the last swabbing test is thought to have shown salt water. The 9-inch casing will probably be cut and pulled and an attempt made to put the well on production in the 4,300-foot zone. The 11¾-inch casing was cemented at 3,557 feet and is said to be bad and the well may have to be redrilled from above. These developments would seem to indicate that further deep drilling might be discouraged, temporarily at least. The Superior's No. 1 fee is standing shut in and no further work is expected for some time. E. H. Mathis is rigging up on his No. 1 while the Republic Petroleum Co. has a rig up on its No. 1 Huntington Beach.

In the Newport district of Los Angeles Basin, the Nuoil Co. recompleted its No. 2 Banning and it was put on the pump doing 60 bbls. of 16.0 gravity oil from a depth of 1,951 feet. The company's No. 1 Banning is now standing idle at 1,607 feet. The Orange County Refining Co. is fishing for liner in its No. 5 in this field. The well has reached 1,225 feet. There was only one well drilling in the Playa Del Rey Field, the Herndon Petroleum Co.'s No. 4, which is drilling at 750 feet. The Co-operative Development Co., Ltd., is rigging up No. 1 on its Community lease. In the Santa Fe Springs Field there was very little drilling activity, the Bellview Oil Syndicate's No. 6 being the only noticeable work. This well was rotating at 4,025 feet.

The Barnsdall and Rio Grande are preparing to make a new search for commercial oil production on a possibly productive structure which parallels its recent discoveries at Gato Ridge in Santa Barbara County and expect to begin drilling a deep test early in January. Approximately 2,200 acres were leased by these operators in Santa Barbara County after geologists made a thorough survey of the territory and announced that a distinct structure in that region is available for exploration. Barnsdall and Rio Grande control the Harris lease embracing 1,700 acres, while the Barnsdall and Rio Grande combination and the Golconda Petroleum Co. have an equal interest in the Carega lease of 1,200 acres. The Carega and Harris properties are 5 miles north of Lompoc and are located on the westerly flank of the Purisima Hills, which were once successfully prospected by the Union Oil Co. and still are considered vast reservoirs of oil. Union has a number of shallow zone producers there but because of a decline in drilling throughout the State has shut in a majority of the wells and resorted to repressuring the area as an experiment to determine the possibility of obtaining greater ultimate recovery of crude. Rio Grande's share in the exploration planned on the Carega and Harris leases is on the same basis as it had in the development of the No. 1 Tognazzini discovery well at Gato Ridge. This project was brought in last summer for 1,000 bbls. of oil per day and then shut in. The Barnsdall Oil Co. intends making a test of its own on part of a 4,000-acre lease northeast of Wheeler Ridge in Kern County. Although it is not obliged to start operations at once, the company is understood to have thoroughly geologized its new lease and is preparing to make a deep test. This property is 4½ miles northwest of the Descanso Co.'s wildcat to be drilled east of the Wheeler Ridge Field.

UNION OIL ACQUIRES KETTLEMAN LEASEHOLD

LOS ANGELES, Calif., Nov. 9.—The Union Oil Co. of California has just announced consummation of a deal with the Belmont Investment Co. whereby the former acquires an undivided one-half interest in the Belmont Investment Co.'s leaseholds covering 640 acres in the North Dome of Kettleman Hills. Of the 640 acres 340 are located within the present blue line of the participating acreage of the Kettleman North Dome Association and entitled to a little more than 3 per cent of the association's total production. The amount of the leasehold's participating acreage may be increased by future developments in the field but cannot be decreased during the initial five-year period of the North Dome Association's existence.

As a result of this deal Union Oil Co. has a prorata share in excess of 1½ per cent of Kettleman North Dome Association's future production and will automatically become a member of that association upon affirmative vote of present members and sanction of the Department of the Interior. The land involved in the transaction embraces 480 acres in Section 24-21-16 and 160 acres in Section 32-21-17, all in the North Dome. The 480 acres in Section 24 are favorably located in the northwest plunge of the Kettleman anticline while the 160 acres in Section 32 are located approximately 1 mile south of Union's Amerada property. Terms of the transaction were not disclosed by either Carl Beal, president of Belmont Investment Co. or Union Oil Co. officials.

KANSAS GEOLOGICAL SOCIETY

At the meeting of the Kansas Geological Society, held in Wichita, Kans., November 7, Doctor VerWiege gave a talk on the "Highlights of the Fifth Annual Field Conference," which was held during the month of August. A large number of pictures showing the geological formations were shown.

TESTING THE SOUTHERN LIMITS OF THE TURNER VALLEY FIELD

By Victor Lauriston
Staff Correspondent, Canadian Fields

CHATHAM, Ontario, Nov. 7.—In the South Turner Valley Field, Hylo Oils' No. 1, L8D 12, Section 4-19-2w5. is deepening and taking production from the Home sands, where a strong show of 41 gravity crude was encountered at 4,965 feet. Before starting to deepen, the crew underreamed and lowered casing to the bottom. After the strike the crude gradually filled the hole, and when swabbing was started it shot over the top of the derrick. No definite production test has been made, but around 1,700 bbls. of crude have been sold, and the well at this depth looks like a fair producer of light crude, though not as large as first expected. No estimate of potential production has been given.

It was at first thought that light crude production came from the Dalhousie sand but analysis of samples has proven the producing horizon is the Home sand, which is above the Dalhousie. The Home sand, in which production was first encountered in Home Oil Co.'s No. 1, contains varying amounts of oil at different points, but Hylo's production in this horizon is probably the largest yet encountered. The Dalhousie sand and Madison lime horizons still remain to be tested, as well as the lower portion of the Home sand. Unless a very large production of light crude is encountered, drilling will be continued to the naphtha horizon in the Madison lime. Light crude production will be taken while deepening.

The light crude showing in Hylo's No. 1, and the fact that nearly all the Turner Valley drilling is concentrated in the south end has revived speculation as to the possible southern limits of the producing structure. The southernmost producer at present is Merland Oil Co.'s No. 1, L8D 13, Section 27-18-2w5, which after getting a freak show of wet gas and crude naphtha in the Dalhousie sand, got a good crude naphtha production when deepened to the lime. Mar-Jon Freehold's No. 1 in L8D 9, same section, is a little farther south and considerably east of the Merland well, and is the farthest south test now active. Since the Home wells in Section 20-19-2w5 first got production, the producing area has been steadily working farther south, with the development of the East Crest, Mercury and Merland areas. Many of the wells have been good producers, with exceed-

(Continued on Page 101)

IMPORTANT SOUTHERN CALIFORNIA WILDCATS

Company, well and location—	S-T-R	Depth	Status
Hines Pet., No. 1 Ocean Park, Los Angeles Co.	9- 2-15	7,350	cemented
Taylor Oil Co., No. 1 Culver, Los Angeles Co.	12- 2-15	6,238	suspended
Westwood Oil Co., No. 2 Hermosa, Los Angeles Co.	6- 4-14	3,151	suspended
Baxter Pet., No. 1 Hermosa, Los Angeles Co.	5- 4-14	rig	suspended
Staple Oil Co., No. 1 Manhattan, Los Angeles Co.	24- 3-15	2,700	suspended
Pacific Shore Oil Co., No. 1 Lawndale, Los Angeles Co.	20- 3-14	rig	suspended
Smith, J. O., No. 1 Lawndale, Los Angeles Co.	20- 3-14	rig	suspended
Wilmington Consd., No. 1 Watson, Los Angeles Co.	17- 4-13	1,012	suspended
Ranger Pet. Co., No. 1 Watson, Los Angeles Co.	28- 4-13	550	sd. drilling
Pedro Pet. Corp., No. 1 San Pedro, Los Angeles Co.	14- 5-14	rig	suspended
Brubaker, W. O., No. 1 Van Nuys, Los Angeles Co.	11- 2-15	2,700	suspended
Rucker & Croul, No. 2 Puente, Los Angeles Co.	27- 2-10	2,200	suspended
El Dorado Oil Co., No. 1 Puente, Los Angeles Co.	20- 2- 9	2,148	br. sh. drilling
Cudahy Oil Co., No. 1 Bell, Los Angeles Co.	30- 2-12	1,570	suspended
Jones, W. L., No. 1 Bell, Los Angeles Co.	31- 2-12	116	sd. drilling
Weist Oil Co., No. 1 Montebello, Los Angeles Co.	34- 1-11	4,902	idle
Blinn & Gray, No. 1 Montebello, Los Angeles Co.	6- 2-11	5,011	suspended
Yellowstone Oil Co., No. 1 Alhambra, Los Angeles Co.	24- 1-13	3,919	suspended
Yellowstone Oil Co., No. 2 Alhambra, Los Angeles Co.	19- 1-12	2,915	fishing
Rucker, L. W., No. 1 Calabasas, Los Angeles Co.	26- 1-17	1,004	br. sh. drilling
Caballero Estates, No. 1 Calabasas, Los Angeles Co.	23- 1-16	1,260	cemented
Olympic Corp., No. 1 Calabasas, Los Angeles Co.	18- 1-17	5,960	suspended
Simi Oil Co., No. 1 Calabasas, Los Angeles Co.	18- 1-17	2,990	br. sh. drilling
Marble, Willard, No. 1 Chatsworth, Los Angeles Co.	6- 2-18	1,170	hd. sd. drilling
Superior Oil Co., No. 1 Newport, Orange Co.	27- 6-10	3,198	sd. sh. drilling
Ajax Pet., No. 1 Newport, Orange Co.	31- 6-10	5,727	br. sh. drilling
Vaqueros Major, No. 1 Tideland, Orange Co.	32- 5-11	1,022	suspended
Beck, Alfred, No. 1 Corona, Riverside Co.	8- 4- 6	1,110	suspended
Alberta Oil Co., No. 1 Elsinor, Riverside Co.	35- 2- 2	3,435	suspended
Duncan, N. L, No. 1 Sagebrush, Riverside Co.	8- 4- 6	1,157	suspended
Colan Dev. Co., No. 1 Redlands, San Bernardino Co.	25- 1- 2	3,392	redrilling
Mason Oil Co., No. 1 Salton Sea, Imperial Co.	1-17-15	615	sd. sh. drilling
Borderland Oil Co., No. 1 Encinitas, San Diego Co.	12-13- 4	2,519	suspended
Borderland Oil Co., No. 1 Point Lomas, San Diego Co.	30-16- 2	5,124	suspended
South Bay Oil Co., No. 1 Border, San Diego Co.	31-18- 2	1,243	suspended
Itasca Pet. Co., No. 1 Mesa, San Diego Co.	33-18- 1	1,570	fishing
Carr, O. K., No. 1 Capistrano, San Diego Co.	13- 6- 8	5,250	suspended
Oklahoma Oil Corp., No. 1 Palms, San Diego Co.	25-11- 8	510	redrilling

IMPORTANT NORTHERN CALIFORNIA WILDCATS

Company, well and location—	S-T-R	Depth	Status
Western Gulf, No. 1 Santa Maria, Santa Barbara Co.	5- 9-35	7,919	br. sh. drilling
Midwest Oil Co., No. 1 Los Alamos, Santa Barbara Co.	2- 7-35	3,450	suspended
Ohio Oil Co., No. 1 Goleta, Santa Barbara Co.	16- 4-28	5,033	redrilling
General Pet., No. 1 Goleta, Santa Barbara Co.	21- 4-28	4,533	gas—shut in
General Pet., No. 2 Goleta, Santa Barbara Co.	21- 4-28	4,350	gas—shut in
General Pet., No. 3 Goleta, Santa Barbara Co.	21- 4-28	6,913	plug 6,625 ft.
General Pet., No. 133 Goleta, Santa Barbara Co.	21- 4-28	2,030	suspended
General Pet., No. 134 Goleta, Santa Barbara Co.	21- 4-28	2,053	suspended
General Pet., No. 136 Goleta, Santa Barbara Co.	21- 4-28	2,047	suspended
General Pet., No. 137 Goleta, Santa Barbara Co.	21- 4-28	2,050	suspended
General Pet., No. 138 Goleta, Santa Barbara Co.	21- 4-28	4,931	suspended
General Pet., No. 139 Goleta, Santa Barbara Co.	21- 4-28	2,051	suspended
Bowles Oil Co., No. 140 Goleta, Santa Barbara Co.	21- 4-28	2,065	suspended
U. S. Pet., No. 141 Goleta, Santa Barbara Co.	20- 4-28	2,004	suspended
U. S. Pet., No. 142 Goleta, Santa Barbara Co.	20- 4-28	2,012	suspended
U. S. Pet., No. 143 Goleta, Santa Barbara Co.	20- 4-28	2,010	suspended
El Camino, No. 149 Goleta Tideland, Santa Barbara Co.	22- 4-28	2,010	suspended
Bellview Oil Co., No. 159 Goleta, Santa Barbara Co.	24- 4-29	2,099	suspended
Cochran, J. H., No. 1 Naples, Santa Barbara Co.	7- 4-29	5,134	suspended
Strickland & Tippett, No. 1-A Goleta, Santa Barbara Co.	19- 4-27	4,886	suspended
Sovereign Oil Co., No. 1 Guadalupe, Santa Barbara Co.	20-10-35	5,500	suspended
Pacific Western, No. 1 Gibraltar, Santa Barbara Co.	14- 5-27	2,345	suspended
Associated, No. 1 Rincon Creek, Ventura Co.	19- 4-24	2,080	suspended
Continental, No. 1 Rincon, Ventura Co.	23- 3-24	6,640	fishing
Bell, H. H., No. 1 South Mountain, Ventura Co.	32- 3-21	1,075	sd. sh. drilling
Pure Oil Co., No. 1 S. F. Canyon, Ventura Co.	15- 4-21	2,591	suspended
San Pedro Oil Co., No. 2 Sespe, Ventura Co.	13- 4-21	3,575	reaming
Magu Synd., No. 1 Oxnard, Ventura Co.	17- 1-21	6,225	may abandon
Mex Cal Oil Co., No. 1 Conejo, Ventura Co.	12- 1-20	240	suspended
Graham & Loftus, No. 1 Goose Lake, Kern Co.	20-27-22	4,040	sd. sh. drilling
Wilshire Oil Co., No. 1-A Buttonwillow, Kern Co.	7-29-24	7,000	suspended
Milham Expl. Co., No. 6 Buttonwillow, Kern Co.	8-28-23	3,527	plug bottom
Purman, T. H., No. 1 McKittrick, Kern Co.	22-29-21	501	suspended
Federal Drlg. Co., No. 1 Buena Vista, Kern Co.	26-31-24	5,367	suspended
General Pet., No. 1 Belridge, Kern Co.	30-28-21	7,161	br. sh. drilling
Wallace, K. C., No. 1 Belridge, Kern Co.	32-29-21	4,222	suspended
Rio Cal Pet., No. 1 Shale, Kern Co.	2-27-18	2,355	suspended
Wicker, Sy., No. 1 Arvin, Kern Co.	12-30-28	3,803	suspended
Shell, No. 1 Weed Patch, Kern Co.	29-30-29	5,910	suspended
Osborn, Colter, No. 1 Weed Patch, Kern Co.	15-30-29	3,465	suspended
Osborn, Colter, No. 2 Weed Patch, Kern Co.	15-30-29	2,000	testing
Fullerton Oil Co., No. 1 Semitropic, Kern Co.	25-27-23	300	sd. sh. drilling
Standard, No. 1 Devils Den, Kern Co.	14-25-18	1,600	suspended
Cumberland Oil Co., No. 2 Devils Den, Kern Co.	21-26-18	2,950	suspended
Signal Oil Co., No. 1 Blackwell Corner, Kern Co.	15-26-19	106	tech. spud
United Kern Pet., No. 1 Mojave, Kern Co.	26-10-14	1,065	suspended
Meridian Oil Co., No. 1 Mojave, Kern Co.	11- 9-15	3,910	hd. sd. drilling
Kendall Dev. Co., No. 1 Mojave, Kern Co.	27-11- 9	765	hd. sd. drilling
Harding, J. B., No. 1 Mojave, Kern Co.	5-10-16	1,030	redrilling
Ritchie, J. J., No. 1 Tejon, Kern Co.	33-11-19	6,025	suspended
Associated, No. 1 Jacalitos, Fresno Co.	22-21-15	6,197	suspended
Kingsburg Expl. Co., No. 1 Kingsburg, Fresno Co.	30-16-23	rig	rigging up
Panorama Oil Co., No. 1 Carrizo, San Luis Obispo Co.	7-31-21	4,019	suspended
Kent & McDonald, No. 1 Carrizo, San Luis Obispo Co.	3-32-22	2,263	br. sh. drilling
Trav-El Oil Co., No. 1 Carrizo, San Luis Obispo Co.	7-32-22	2,450	suspended
Paso Robles Synd., No. 1 Paso Robles, San Luis Obispo Co.	34-27-11	4,040	suspended
Cent. Coast Inv. Co., No. 1 Atascadero, San Luis Obispo Co.	1-28-12	1,040	br. sh. drilling
Schilling, C., No. 1 Atascadero, San Luis Obispo Co.	24-28-12	1,475	suspended
Pacific Inland, Well No. 1, Monterey Co.	19-23-15	1,925	hd. sh. drilling
Brown, W. F., No. 1 Parkfield, Monterey Co.	15-23-14	1,051	suspended
Guess, W. G., No. 1 Monocline, Kings Co.	7-21-21	4,620	resume work
Local Gas Co., No. 1 Dudley Ridge, Kings Co.	32-22-20	rig	rigged up
Irma Investment Co., No. 1 Dudley Ridge, Kings Co.	7-23-20	1,345	gas well—idle
O'Donnell, J. E., No. 1 Dudley Ridge, Kings Co.	7-23-20	1,635	gas well—idle
Eagle Oil Co., No. 1 Dudley Ridge, Kings Co.	15-23-20	411	drilling
Kettleman Lakeview, No. 1-A Dudley Ridge, Kings Co.	20-23-20	1,170	gas well—idle
Valley Expl. Co., No. 1 Dudley Ridge, Kings Co.	12-23-19	1,287	redrilling
Valley Expl. Co., No. 2 Dudley Ridge, Kings Co.	12-23-19	1,141	cemented
Knudsen & Schmidt, No. 1 Reef Ridge, Kings Co.	36-23-17	4,315	suspended
Seymour, L. W., No. 1 Avenal, Kings Co.	16-23-16	1,148	suspended
Twin State Oil Co., No. 1 Point Arena, Mendocino Co.	14-13-17	7,700	fishing
Orinda Pet., Well No. 1, Contra Costa Co.	32- 1- 3	2,120	suspended
Tulaco Oil Co., No. 1 Corcoran, Tulare Co.	17-22-22	....	material
Ducor Pet. Co., No. 1 Ducor, Tulare Co.	14-24-27	2,200	suspended
Inland Valley Oil Co., No. 1 Visalia, Tulare Co.	24-17-24	2,092	suspended
Ellis & Stanford, No. 1 Tulare Lake, Tulare Co.	30-24-23	1,906	sd. sh. drilling
Colusa Oil Co., No. 1 Bush, Colusa Co.	31-15- 4	970	hd. sd. drilling
Oakdale Oil Co., No. 1 Oakdale, Stanislaus Co.	3- 2-10	4,220	hd. sd. drilling
Orland Oil Synd., No. 1 Orland, Tehama Co.	31-23- 3	3,040	suspended

New Oil Pool in Wyandot County, Ohio

Tymochtee Township Producer Shows Million Feet of Gas and Turns to Oil After Shot. Report of Michigan and Kentucky Operations

By George A. Whitney
Staff Correspondent, Central West Fields

FINDLAY, Ohio., Nov. 9.—Completions were scarce in parts of the Central West Field, the most active development being in the Central Ohio division. Indiana and Illinois failed to record any completions, and the Old Lima Field could only muster up two wells, one that is important being half a mile in advance of gas production. This well is owned by McPheron, Miller and Cook, and is a test on the Bowman-Billhart farm, Section 21, Tymochtee Township, Wyandot County. It was drilled to a total depth of 1,369 feet, the top of the Trenton at 1,363 feet and is located on low ground a short distance from the Sandusky River. When drilled in it showed 1,000,000 feet of gas, but when shot, the gauge showed but 786,000 feet and oil broke through and a 100-bbl. tank was quickly set up and the well was allowed to flow, putting 8 inches of fluid in the tank in an hour, indicating the opening of an entirely new oil pool that will bring about more active development in that part of the state. Rig No. 2, close to the river bank, expected to start spudding at once.

The other completion was made by unknown parties on the Jacob Croll farm, near Vermillion, in Erie County, far to the east of the old Trenton Rock Field, and is estimated good for close to 200,000 feet of gas from a shallow depth. This well caused some excitement in the eastern part of Erie County, and it is predicted that shallow gas producing sand will be found on the south shore of Lake Erie, same as across the lake on the Canadian side, where hundreds of shallow gas holes were drilled some years ago.

CENTRAL OHIO

Fifteen completions were reported from the Central Ohio Field of which seven were producers with an initial production of 91 bbls. and eight were gas wells. The most active spot is in Stark County, where exceptionally good gas wells are being found, but at a great depth, the gas being found around 4,200 feet.

In Ashland County, the Ohio Fuel Gas Co. found a light gas well in No. 1-5,562 on the C. L. Cline farm, Section 16, Orange Township. Eddy and others are shut down in No. 4 on the Edward Gardner farm, Section 17, Perry Township. Hulse & Kundtz, Inc., are starting a test on the Clare Fraunfelter farm, Section 10, Montgomery Township.

In Lorain County, Ohio Fuel Gas Co. has a gas well in No. 1-5,553 Max Hanrosh farm, Section 15, Carlisle Township.

In Medina County, Chatham Township, the Mecca Belden Field is showing some shallow oil wells, the oil being almost a natural lubricant. Edson Sons Co. drilled in four producers: No. 22 George W. Packard farm, Section 4, with an initial of 10 bbls. from 321 to 386 feet; No. 23, same farm, 25 bbls. the first 24 hours from 319 to 391 feet; No. 17 on the Daniel Ross farm, Section 7, 10 bbls. initially from 365 to 415 feet, and No. 30 Marcus A. Frank farm, Section 20, with 18 bbls. from 423 to 440 feet. The Preston Oil Co. is drilling No. 20-1,490 on the C. and E. Clapp farm, Section 5, same township. Harris & Behn are drilling No. 20 on the Gilman Brothers farm, Section 20, same township. Barnhart and others have a rig on the E. G. Norton farm, Section 23, Westfield Township.

In Cuyahoga County, Rockport Township, L. T. McGrath is shut down at his test on the John E. Raible farm.

In Coshocton County, Perry Township, Murphy and others have what shows for a 2-bbl. pumper along with a fairly good gas producer on the Myers & Mosshold farm, Section 15.

Licking County

In Licking County, Hopewell Township, the Wehrle Gas Co. got a fair gas producer on the Charles F. Kraeger farm, Section 33, in the Lime formation from 2,132 to 2,608 feet. L. C. Robinson is drilling No. 1 Halley M. Burton farm, Section 9, Monroe Township.

In Muskingum County the only change is the Athey Co.'s No. 1 Homer Bendure farm, Section 9, Washington Township, which is drilling.

In Athens County, Waterloo Township, Standard Natural Gas Co. is drilling on the David Young farm, Section 12.

In Stark County, Lawrence Township, Brendall and others are drilling No. 3 T. and F. Lesser farm, Section 12. Same parties completed a nice gas well in No. 2 J. C. Steiner farm, Section 16, Jackson Township, same county, in the Clinton from 4,255-92 feet, and have a rig in for No. 1 J. J. Kurtzeman farm, same section. Boettler and others hit a nice gas well on the F. L. Kirchofer farm, Section 10, in the Clinton from 4,354-92 feet. Wiser Oil Co. also brought in a fair gas well in No. 1 H. M. Schuffell farm, Section 1, in the Clinton from 4,366-83 feet. East Ohio Gas Co. is drilling No. 1 Earl Johnson farm, Section 15, and has a rig in for No. 2, same farm. Same company made a location for No. 1 Bessie J. Slagel farm, Section 14, all in Jackson Township.

In Knox County, Union Township, H. E. Perkins' No. 1 Warren Farmer farm, Section 23, is an average gas well along with 3 bbls. of oil from 2,953-66 feet. Hulse & Kundtz, Inc., found a fair gas well in No. 5 J. H. Colopy farm, Section 22, same township, from 656 to 659 feet.

In Guernsey County, W. B. Urban and others have a rig in for a second test on the Guernsey Valley Fair Co.'s land, Sections 21-22, Jackson Township. W. Keither has a rig in for No. 1 Bertha M. Smith farm, Lot 36, and R. E. Neddleson and others have a location for No. 7 on the William Millhone and others farm. Section 17, Jackson Township. E. O. Quillan and others have a rig up for No. 2 Isaiah Cremlett farm, Section 10. Wheeler Township, same county. Center Gas Co. is drilling deeper its No. 1 L. A. Wharton farm, Section 15, Center Township, same county, and going to the Gordon sand.

In Belmont County, J. L. Jeffries and others have a light gas well in No. 1 Anthony Burkhart farm, Section 33, Somerset Township, in the Berea sand at 1,827 feet.

In Meigs County, Stewart & Ross' No. 5 S. C. and Gazelle Stanzart farm, Section 6, Bedford Township, Meigs County, was a dry hole in Maxon and Injun sands at a total depth of 1,136 feet. Simpson & Rice are drilling No. 1 Thomas Jackson farm, Section 11, Sutton Township, and the Scioto Oil & Gas Co. is drilling No. 2 Cora L. Russell farm, Section 35. Salisbury Township, same county. Same company is drilling No. 2 H. F. Johnson farm, same section. Joe Kigging and others are drilling No. 1 Robert Jacks farm, Section 28, same township.

KENTUCKY

Five completions were reported in Kentucky, one being an oil well, two gas and two dry holes. United Petroleum Corp. is reported to have brought in a gas well near Crofton, in Christian County, with a reported volume of about 2,500,000 feet. Lambert and others drilled in a fair gas well in No. 1 on the Jack Cowan farm, in the Victoria Pool, in Hancock County. In the Richards Pool, same county, D. T. Bolling found a dry hole in No. 4 on the Louis Richardson farm at a depth of 310 feet.

In Ohio County the Chester Oil Co.'s No. 1 on the Frank Hanna farm, in the Deanfield area, produced an initial of 30 bbls., and the same company is drilling No. 1 on the I. T. Westerfield 30 acres, in the Friendship Pool. Cumberland Petroleum's No. 2 Herbert Garden farm, in the Hainesville Pool, was dry at 318 feet. H. L. Ogle and others are drilling No. 1 Westerfield farm, in the Friendship Pool, and S. H. Cobb and others are drilling No. 1 on the Laura Mercer 108 acres. Brenner-Adams Co. is drilling No. 5 A. T. Bellamy north 45 acres, same county.

S. H. Russell and others are drilling No. 1 S. Tanner farm, in the Clyer Pool, in Daviess County.

MICHIGAN

Oil and gas producers have organized a new group to plan united action to aid the industry in Michigan. Representatives of 30 different producing companies, royalty owners, drilling concerns and others operating in the Michigan oil and gas fields met at Mount Pleasant and organized the Oil and Gas Producers Association of Michigan. One of the association's immediate aims will be to take steps to bring about increased prices of crude oil, now quoted at 55 cents a barrel. H. W. Grant, Mount Pleasant, attorney for the Michigan Oil & Gas Co., was elected president. Elsworth Brown, Midland, was named vice president and W. W. Russell, Mount Pleasant, secretary-treasurer. A second meeting of the association to name committees on by-laws and membership will be open to all persons interested in the development of Michigan's oil and gas fields.

The new pool, some 3 miles east of the old Chippewa-Greendale Pool, has opened the way for extensive development. A number of wells ranging in production from 1,000 bbls. daily to 3,700 bbls. have been completed. Under the proration only 500 bbls. may be produced daily from these wells. The association will attempt to open new markets for Michigan crude and it was indicated steps will be taken to induce new pipe line concerns to start operation in the field. There are at present upwards of 325 producing wells in a field estimated of 20,000 proven acres.

Among those represented at the meeting were: G-Lee-P Oil Co., B. G. Scollay, E. Brown Oil Development Co.; E. Brown, Sias Oil Co.; H. Eastman, Chippewa Oil Co.; George Pirtle, Old Dutch Co.; Hugh Crider, Michigan Oil & Gas Co.; John C. Arthurs, J. C. Arthurs Development Co.; H. W. Grant, Michigan Oil & Gas Co.; H. Eastman, Isabel Oil Development Co.; Isaac Shuler, Stork Oil Co.; John Ashbury, Shell Petroleum Corp.; L. C. Moule, Stanolind Oil Co.; Robert Crippen, Chartiers Oil Co.; Fred Stilgenbauer, Mount Pleasant Oil & Gas Co.; Harry Tope, Meridian Oil & Gas Co.; W. L. McClanahan, Burke White, Leon Thompson, E. M. Shield, B. C. Calkins, J. E. Guncheon, Dan Johnson, William Watters, John D. Elder, W. W. Russell and H. C. McFarland.

Five Completions

There were five wells completed in the Michigan territory during the week. Three good oil wells were found in the New East Field, in Greendale Township, Midland County; one gas well in Vernon Township, Isabella County, and one dry hole in Sumpter Township, Wayne County.

In the Central Michigan Field, the Pure Oil Co. drilled in No. 2 on the Pure company's land known as the Purtell farm, Section 15, Greendale Township, Midland County, estimated flowing close around 2,000 bbls. initially from the Dundee formation. Gordon Oil Co.'s No. 4 Noah Skinner farm, S half SW Section 9, same township, showed an initial of 700 bbls. from the same formation, only in the upper pay, and will not be drilled to the second and third pay, as only 500 bbls. a day can be run into pipe line. The third completion was the Talbot Oil Co.'s No. 2 on the Adams farm, west of the Struble well, in Section 10, same township.

In Vernon Township, Isabella County, T. K. Buzzard's No. 1 on the J. and E.

(Continued on Page 150)

PENNSYLVANIANS WATCHING TEST ON CHESTNUT RIDGE ANTICLINE

By Staff Correspondent

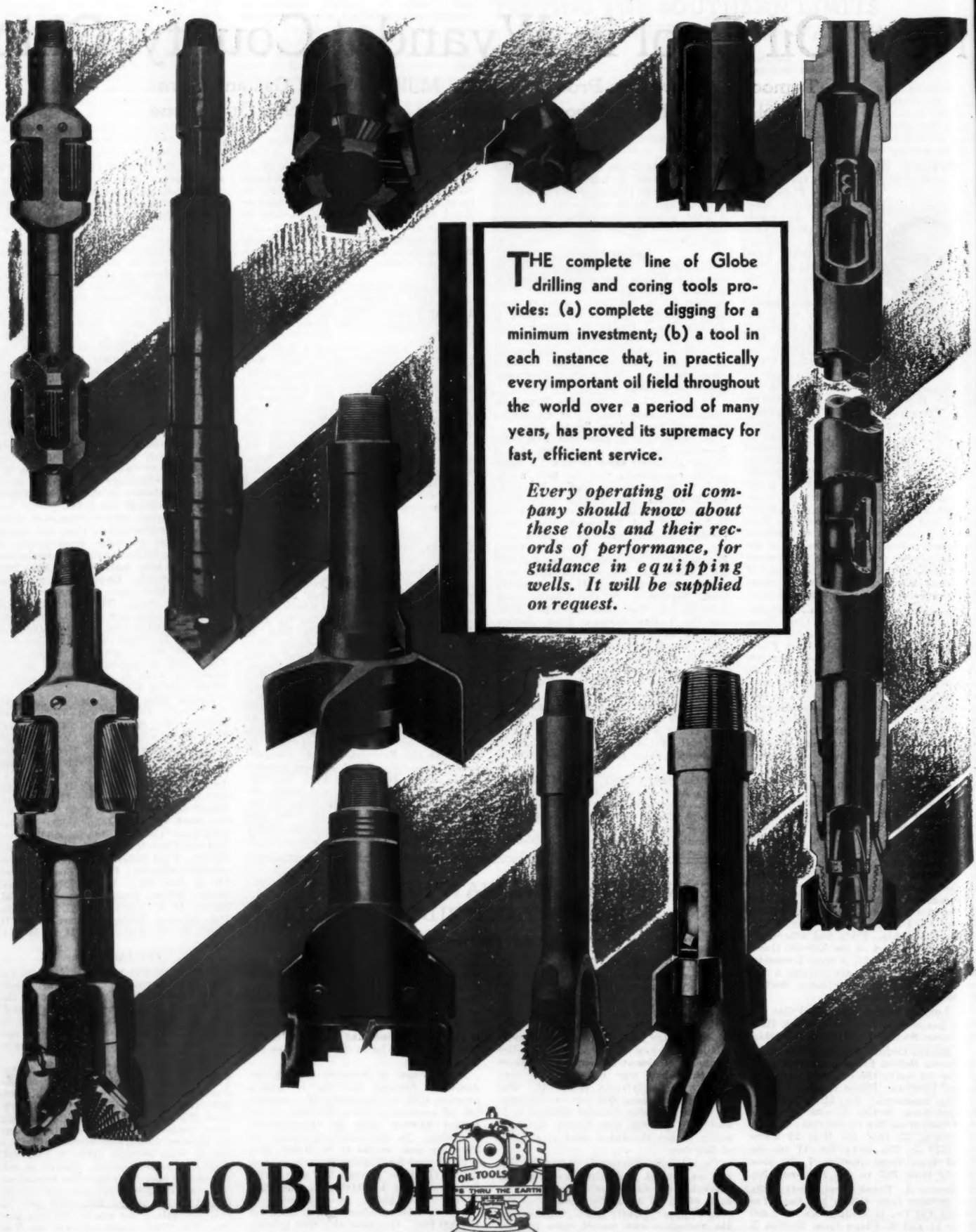
PITTSBURGH, Pa., Nov. 9.—In Bullskin Township, Fayette County, Pennsylvania, the Dunn Mar Oil & Gas Co. jointly with the Consumers Fuel Co. have started a test on the Anna Grimm farm which lies on the Chestnut Ridge anticline. On the map, this farm lies about 5 miles southwest of Donegal, and 5 miles southeast of Mount Pleasant, or south of the point half way between these two towns on Pennsylvania Route 31. The well is down about 600 feet at the present time and after passing through a 2-foot vein of coal and having met salt water, struck the Injun sand at a depth of 550 feet.

Considerable interest is shown in this test as several geologists have reported favorably on this location which, it is said, offers as attractive chances as the present upper country boom. Chief among the geologists who passed upon this location was West Virginia State Geologist J. D. Sisler. The present operators have leased in excess of 30,000 acres.

Last year, the T. W. Phillips Gas & Oil Co. did considerable testing east of the ridge but farther to the north and east of the present location. One hole was sunk to about 4,000 feet on the Darr farm in Cook Township. This, however, lies in the trough, whereas the Grimm location is on the west flank of the arch. It is understood, the test is to be drilled to the Bradford and the Speechley sands, with other sands being encountered on the way.

Farther east in Somerset County, the American Natural Gas Co. is making progress with its fourth test in a straight line of production down 600 feet on the Robert Herwig farm in Quemahoning Township. As that pool now stands, the discovery well on the O. S. Miller farm is rated good for 750,000 feet, the second, the W. H. Miller, about a half mile northeast, tested for 1,500,000 feet, the third on the I. W. Maust, about a half mile farther northeast, after shot, is good for 100,000 feet. Gas from this well is being used to drill the fourth test, still a half mile distant on the Robert Herwig farm. The operators have expressed opinion that this pay streak extends considerable distance. The sand in the Maust well was

(Continued on Page 89)



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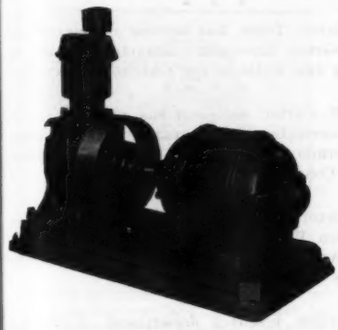
COMPRESSOR ADDITIONS ANNOUNCED BY SULLIVAN

The Sullivan Machinery Co., 400 North Michigan Avenue, Chicago, announces additions to its line of vertical single act-



ing compressors, in new models, and new capacity ranges.

WL-1 belt driven, V-belt driven and WL-11 direct motor driven compressors are single cyliner, single acting units, distinguished by the use of heavy duty ball bearings for mounting on the crankshaft and also by their compactness, simplicity and substantial construction. The cylinder is cast separate from the frame, and the head, containing the inlet and discharge valves (of the Sullivan "wafer" type) may be attached in any one of four horizontal positions, to gain convenience in piping connections.

These units provide displacement ranges from 27 to 87 cubic feet per minute. Direct connected units employ flexible external and internal gear couplings between the compressor flywheel and the motor shaft. The Sullivan "sweep control" unloading system is employed, and customers may have automatic regulation of several types, including manual, semi-automatic and fully automatic start and stop control for both the belt and direct connected units. These compressors are designed for pressures up to 125 pounds per square inch.

The Sullivan WL-2 and WL-4 belt driven vertical units are available in two-cylinder and four-cylinder models respectively, and are similar to the direct connected two-cylinder and four-cylinder units WL-22 and WL-44. These units may also be driven by V belts from any desirable form of power unit, and in such cases are mounted on a sub-base which supports the compressor, motor, and V belt drive. Capacities range from 119 to 348 cubic feet free air per minute. The four-cylinder units are V type balanced design, the two pairs of cylinders being set at an angle of 90 degrees with a common crankshaft and only two cranks. This provides a compact and short arrangement, and an important factor of balance. The use of four smaller cylinders instead of two large ones, permits the use of reciprocating parts which weigh only one-third as much as the same parts would weigh in a two-cylinder unit of equivalent capacity; while the light weight of the small moving element holds to a minimum, the force tends to cause vibration.

Catalog 88-B describes the single cylinder WL-1 and WL-11 compressors. Catalog 88-C describes the WL-2 and WL-4 belt driven compressors.

A 36-page catalog, designated as No. 20-A, has been issued by the Refinery Supply Co., Dallas, Tex., and Tulsa. It is devoted to scientific laboratory and plant equipment.

NOTES ABOUT TRADE LITERATURE

Industrial "Cro-tung" for oil refinery service and other uses is the subject of a 36-page booklet issued by Industrial Steels, Inc., 250 Bent Street, Cambridge, Mass.

Calibration of the Stormer viscosimeter is explained by charts and text in the current number of Drilling Mud, published by the Baroid Sales Co., 837 Jackson Street, Los Angeles, Calif.

Introduction of the Dardelet self-locking thread into sucker-rod joints has brought new efficiency and economy into oil pumping operations, according to Bulletin No. 7, being distributed by the Dardelet Threadlock Corp., New York.

Bores and Strokes, the monthly publication of Schramm, Inc., West Chester, Pa., presents pictures of Schramm compressors in interesting jobs.

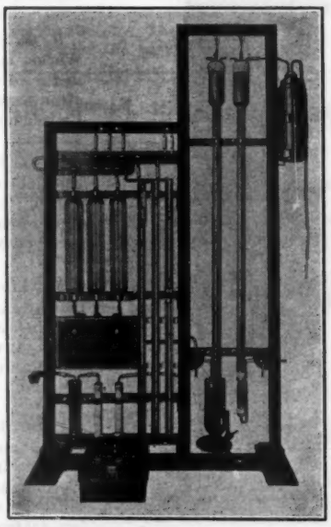
A broadside in colors issued by the Byron Jackson Co., Los Angeles, Calif., records briefly the development of this oil field equipment manufacturing concern from a blacksmith shop in 1872.

A 16-page booklet in colors prepared by the Winton Engine Corp., Cleveland, Ohio, is devoted to description and illustration of Winton Diesel engines.

Articles of timely interest to refiners and others appear in the current number of Heat Engineering, published by the Foster Wheeler Corp., 165 Broadway, New York.

IMPROVED PRECISION APPARATUS ANNOUNCED

Radical and important improvements are incorporated in the new Standard Precision Model A low-temperature fractional distillation apparatus announced by the Podbielniak Analytical and Re-



search Laboratories of Tulsa. With only minor adjustments by the operator the new apparatus may be used, according to the manufacturer, for the analysis of samples ranging in volatility from manufactured and natural gases to motor fuels and absorption oils with as much convenience and accuracy as if the apparatus were specifically designed for the particular sample analyzed.

The analysis of highly complex gases by fractional distillation and supplementary tests is simplified and made more accurate by the fraction collecting arrangement. Greater sensitivity and accuracy have been gained by radical changes in the design of the fractionating columns. The columns are made in two parts, the distilling tube being entirely separate and removable from the sleeve-type vacuum jacket. This construction permits the use of any type of distilling tube and bulb best suited for a particular analysis, with a standard vacuum jacket. The distilling tube is free from all bulky seals and therefore from any unnecessary holdup of liquid detrimental to sharp fractionation.

A novel metal reflector replaces the conventional silvering in the vacuum jacket which increases its thermal insulation 50 per cent or more. A new type of barometric manometer can be cleaned, refilled with mercury and re-evacuated without dismounting from apparatus.

The apparatus is redesigned throughout with many other new features which are fully described in circular No. 4, obtainable from the company. Included also in this catalog are descriptions of a new type of thermos container containing a metal reflector in the vacuum jacket of exceedingly high thermal insulating efficiency; standard gas and gasoline sample containers, designed to conform with I.C.C. shipping regulations, having a valve and screwed-on valve-cover at each end of the container; special packless and leakproof sample container valves having a special flexible metal device absolutely tight against leakage past the valve stem so that they may be used to store even extremely volatile natural gasoline samples indefinitely without change of composition.

Two other circulars devoted to subjects closely connected with the above new products are No. 5, "Glassblowing and Construction of Special Scientific Apparatus," and No. 6, "Analytical, Consulting and Research Service" in which the Podbielniak laboratories announce that they have added to their analytical service precise high temperature fractional distillation analyses of motor fuels, absorption oils and petroleum crudes using a new apparatus developed by the laboratory.

The foregoing circulars, together with reprints of any articles mentioned therein, are available by writing direct to the Podbielniak Analytical and Research Laboratories, 1208 Medical Arts Building, Tulsa.

MERGE WITH AMERICAN METER

Announcement has been made of the acquisition by the American Meter Co. of the Reliance Manufacturing Co. and the Reliance Iron Works of Alhambra, Calif. A new company is being formed under the name of Reliance Regulator Corp. to conduct these properties. The management of the former Reliance interests will be retained intact and no changes in the present personnel of the Regulator division are contemplated. It is said Walter M. Thompson, president, and other directors of the former Reliance companies will be elected to the board of the Reliance Regulator Corp., as well as the additional members who will represent the new interests. The American Meter Co. manufacturers a complete line of displacement meters, orifice meters and rate volume controllers, as well as gas and meter testing apparatus for the gas and oil industries.

MEN KNOWN *in* THE EQUIPMENT FIELD

E. L. MacBlain, refinery engineer for the Reading-Pratt & Cady Co., Inc., Bridgeport, Conn., is now located at 1112

E. L. MacBlain

Fair Building, Fort Worth, Tex. Mr. MacBlain brings to his new work a broad experience in the petroleum industry. Previous to his present connection he was associated for nine years with the Humble Oil & Refining Co.

IDECO IN SALES ARRANGEMENT

The International-Stacey Corp., Columbus, Ohio, and the Wheeling Steel Corp., Wheeling, W. Va., announce that arrangements have been completed for world-wide distribution of Wheeling oil country tubular goods, through the sales organization of the International Derrick & Equipment division. This rounds out Ideco's line of pumping and drilling material following negotiations between officials of both companies. Ideco will establish stocks of Wheeling tubular goods throughout the active oil and gas fields at strategic distributing centers. This arrangement does not disturb the identity of the two companies, nor does it affect the existing distribution of Wheeling tubular goods through other channels.

The Wheeling line of welded and seamless oil country pipe includes A.P.I. and standard drill pipe, casing, tubing, line and drive pipe. For the refinery and pipe line companies, this arrangement immediately makes Wheeling tubular goods available in distribution centers close to their fields of activity. Natural and artificial gas utility companies will be supplied through the sales organization of the Stacey Gas Construction division of the International-Stacey Corp.

ENGINEERING SERVICE COMPANY

The Petroleum Engineering Service, Inc., has been organized with offices in the Towers Petroleum Building, Dallas, Tex., to construct pipe still distillation equipment and conduct consulting petroleum engineering business. Officers of the new company are: Emil Geppelt, Jr., president; Allen M. Peairs, secretary-treasurer; and R. T. Meador, vice president. Mr. Geppelt was formerly a consulting engineer. Mr. Peairs formerly was connected with the Foster Wheeler Corp., and Bethlehem Steel Corp. Mr. Meador is a member of the law firm, Meador & Meador, in Dallas.

Personal Paragraphs About Oil Men

Col. H. C. B. Hickling, general manager of the Apex (Trinidad) Oilfields, Ltd., has returned to Trinidad.

* * *

Marshall Hardy of the Mid-Continent Petroleum Corporation is spending a two weeks' vacation in Mississippi.

* * *

J. M. Lantz, production superintendent for the Pure Oil Company in Michigan, is recovering from a recent illness.

* * *

W. L. Scott, sales manager of the American Refining Properties, Wichita, Falls, Tex., spent two days in Tulsa last week.

* * *

Clayton G. Dorn, secretary and treasurer of the Forest Oil Company, Bradford, Pa., is entertaining his brother, C. A. Dorn, a Denver, Colo., oil man.

* * *

Rex B. Beisel, formerly vice president of the Spartan Aircraft Company, Tulsa, is now with the Chance Vaught Corporation, East Hartford, Conn.

* * *

Edward Nolan, assistant purchasing agent of the Carter Oil Company at Tulsa, is recovering from an operation at a local hospital. He is expected to leave the hospital in a few days.

* * *

Mr. and Mrs. Walter J. Buzzini of San Antonio, Tex., have a boy, born recently. Mr. Buzzini is a member of the firm of Jacob, Buzzini & Pickett, independent operators of San Antonio.

* * *

H. D. Frueauff, head of the refining and marketing departments of the Cities Service Company, New York City, is recovering satisfactorily from injuries received recently in an automobile accident.

* * *

William M. Howard, geologist, formerly with the Milham Corporation at San Antonio, Tex., but for a couple of years with the Gulf Exploration Company in Java, Dutch West Indies, is now at Dixon, Calif.

* * *

C. W. Gross, former supervisor of the oil and gas division of the Montana railway commission, has been elected secretary of the Montana division of the Independent Petroleum Association of America.

* * *

Alex W. McCoy, vice president of E. W. Marland Company, Inc., and Marvin Fountain, an independent oil operator, both of Ponca City, Okla., are spending a few weeks on hunting trip in eastern Colorado.

* * *

P. N. Carr, Jr., son of Mr. and Mrs. P. N. Carr of Casper, Wyo., who has been associated the last few years with the Sinclair interests at Caracas, South America, has arrived in New York. Later he will go to Wyoming to spend the Christmas holidays with his parents.

* * *

R. H. Hall, who for many years has represented the Philip Carey Company, is now representing the Ruberoid Company. Mr. Hall is located at 2104 Magnolia Building, Dallas, Tex., and will handle the sales of the industrial division covering pipe line protection, tank roofing and asbestos products from this office.

* * *

K. D. Pardee of Billings, Mont., superintendent of operations in northern Wyoming and Montana for Texas Production Company, was in Casper, Wyo., and made a trip to Alkali Butte, where the company expects to do some work on the gas wells completed several months ago. Mr. Pardee was accompanied by Mrs. Pardee.

* * *

A. W. Thompson, who for the past five years has been Pacific Coast manager in charge of sales for Fairbanks, Morse & Company, has been appointed vice president in charge of manufacturing, according to an announcement made public by W. S. Hovey, president. Mr. Thompson succeeds Mr. Heath, who resigned November 1.

Dr. D. R. Semmes, consulting geologist at San Antonio, is back from a trip to New York and the East.

* * *

Frank Esch, representing W. Nugent & Company, Chicago, Ill., is spending some time in the Mid-Continent contacting trade.

* * *

Dr. B. T. Brooks, consulting chemist and engineer of New York City, has been a business visitor in Tulsa during the past week.

* * *

Theo M. Martin, advertising manager of Byron Jackson Company, Los Angeles, has recovered from his recent illness and is now back at the office.

* * *

P. D. Moore, who has been on the geological staff of the Imperial Oil Company, Ltd., with offices in Calgary, Alta., has left for San Angelo, Tex., where he is to be associated with his brother, John I Moore, also a geologist.

Men of the Industry

Comer Plummer

Before Comer Plummer, manager of the southwestern producing division of the Pure Oil Company, entered the oil business he was for six years a court reporter in Eastland County, Texas, after which he studied law and was admitted to practice in that county. He was in the legal department of the Humphreys Corporation in 1923 when the company was taken over by the Pure Oil Company. Many of the Humphreys staff found themselves without employment. The young lawyer was informed that he could be retained if he would take a job in the field. He decided to stay and for three years he learned from rough experience the work of the production department, first as a roustabout, then in the rod crew and later as farm boss.

In 1926 Mr. Plummer was assigned to a position in the land department and the next year he was transferred to Tulsa to become assistant ot the late Howard N. Cole, manager of the southwestern producing division. When Mr. Cole died, in May, 1928, Mr. Plummer was the one man familiar with the details of the office and thoroughly grounded in all phases of the production department, and he was selected to take over Mr. Cole's duties.

Mr. Plummer, who was born in Huntsville, Tex., resides with his wife and two children in South Troost Avenue, Tulsa. Golf is his favorite diversion.

John F. Camp, independent operator at San Antonio, Tex., has lately been on a trip to New York and eastern cities.

* * *

A. F. Garrett, sales manager of the Lone Star Gasoline Company, Dallas, Tex., spent several days in Tulsa last week.

* * *

Forrest Baker, Tulsa, has become associated with the Cardin-Green interests, contractors, which are now drilling two wells in the Oklahoma City field.

* * *

Leonard F. Carter, assistant gas engineer for the Colorado Interstate Gas Company, with headquarters at Colorado Springs, Colo., recently visited on the Pacific Coast.

* * *

Richard Detert of San Francisco, Calif., president of the Golden West Oil Company, has lately been at the San Antonio, Tex., office of the company for several days on business.

* * *

A. L. Clayden, research department of the Sun Oil Company, has been transferred from Philadelphia, Pa., to Detroit, Mich., where he will continue investigations of motor fuel.

* * *

William S. Marsden was recently appointed field representative of the Ethyl Gasoline Corporation at Allentown, Pa. He had previously been industrial engineer with the Pure Oil Company at New York.

* * *

P. C. Stevens, representing the Muskegon Boiler Works, manufacturers of oil and gas separators, is in the Mid-Continent and will return to the factory after stopping off at Chicago to attend the American Petroleum Institute convention.

* * *

A. M. Porter, superintendent of natural gas and gasoline plants for the Shell Oil Company at Long Beach, Calif., has resigned. R. S. Tulin, field superintendent of Shell's gas and gasoline plants, succeeds Mr. Porter in the superintendency.

* * *

The latest oil man to arrive in San Antonio, Tex., is Roy Allen Dobbins, Jr., born October 5. Mr. Dobbins, Sr., now an independent operator, was for many years in the land department of the Atlantic Oil Producing Company, and stationed at San Antonio.

* * *

J. M. Linehan of Prairie Pipe Line Company, Tulsa, and Jerry Murphy of Indian Territory Illuminating Oil Company, who are vacationing in Florida, are bewildering some of their friends in Tulsa by sending them live alligators of about two feet in length.

* * *

John Harris, formerly district superintendent of Bartex Pipe Line Company in the Texas Panhandle, has been made general superintendent with headquarters at Bartlesville, Okla. He is succeeded in the Panhandle by S. P. Turner, formerly with the Champlin Refining Company.

* * *

William N. Crawford, superintendent of production in the Nowata, Okla., district with the Prairie Oil & Gas Company, has been transferred to Neodesha, Wilson County, Kansas, in charge of the company's production in that district. He succeeds Elmer Bryson and J. W. Jenkins, retired.

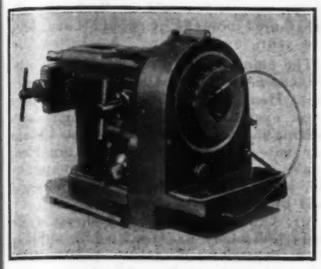
* * *

Paul L. Brooks, formerly district manager at Fort Worth, Tex., for the Parkersburg Rig & Reel Company, has been placed in charge of the district office of the company at Dallas, which office is a consolidation of the Fort Worth and Shreveport district offices. The Dallas office now has jurisdiction over East Texas, West Texas, Northern Louisiana, Arkansas and Mississippi. S. P. Wallace has been transferred from Tulsa to Longview, Tex., and will have charge of the field operations in East Texas, reporting to the Dallas office.

Oil Industry Equipment and Supplies

PIPE THREADER WEIGHS LESS THAN 190 POUNDS

The Axelson portable pipe threader, now marketed by the Axelson Manufacturing Co., Los Angeles, Calif., weighs less than 190 pounds, consumes little



power and operates rapidly. It can be attached to any standard light socket, is powered by a General Electric Universal reversible motor, and may be used on any 110-volt circuit.

The threader will handle pipe in all sizes from one-half-inch to 2-inch. Bolt threading dies also may be used, although they are not furnished as standard equipment. As an indication of the speed with which this threader operates, it is said that 2-inch pipe may be cut, reamed and threaded complete in less than 2½ minutes, with other sizes faster in proportion.

The operating principles of the machine are simple, a standard square die being revolved on the pipe instead of revolving a bulky length of pipe through a die head. This not only makes a straight thread, but it enables the operator to run thread on long pipe stands. Among outstanding advantages enumerated by the company are automatic feed, cutter head or reamer quickly installed in place of threading die, oil pump lubrication, automatic self-centering jaw chucks, speed and economy of operation.

IMPROVEMENTS MADE IN RECORDING INSTRUMENTS

Several changes in its strip chart recording instruments, type CD, have been announced by the General Electric Co. The chart reroll unit is now separate and spring-driven, releasing the clock of all duty except keeping time. Only two turns of a thumbscrew are required for fastening or removing the cover of the instrument. The clock is completely enclosed. Either a Warren synchronous motor or a spring-clock movement affording nine days' operation is provided at the option of the purchaser.

The terminal block on the portable model is tilted 30 degrees, allowing use of a screwdriver from the front. Indicating scales, standard equipment in addition to the charts, are removable and interchangeable. The chart speed of portable types can be changed readily from inches per hour to inches per minute by means of a gear-shift lever, without removing the cover. Another lever is used for starting and stopping the clock. An automatic locking device prevents the reroll spring from running down when the used paper roll is removed; and an automatic brake for the roll of supply paper balances the pull of the reroll, prevents pulling the paper off the driving sprockets or overrunning the clock, and permits accurate timekeeping.

The type CD recording instruments are available for d-c. or a-c. operation, and for portable or either front or back-connected switchboard mounting. The switchboard instruments can be mounted on 5½-inch centers. No increase in price was made with the improvements.

AMONG THE EQUIPMENT HOUSES

Harry S. Sleicher, formerly vice president of the North American Refractories Co., has severed his connection with that company and is now associated with the General Refractories Co. in a sales capacity, with headquarters in the New York office.

The S. R. Dresser Manufacturing Co., Bradford, Pa., has organized the Dresser Manufacturing Co., Ltd., a Canadian corporation with head offices at 32 Front Street, West, Toronto, Ont. Associated with the new company as director in charge of sales is D. B. McWilliams.

The board of directors of the Westinghouse Electric and Manufacturing Co. has elected W. L. Mellon a member of the executive committee to succeed the late Harrison Nesbit.

The new unemployment relief plan offered to employes of the General Electric Co. has been accepted by them. A tabulation of the votes showed that 89.5 per cent of those employes eligible to vote had cast ballots and that 98 per cent of them favored adoption of the plan.

Chatard & Norris, 218 Water Street, Baltimore, Md., have been appointed exclusive representatives of the Homestead Valve Manufacturing Co. for the eastern part of Maryland and the District of Columbia.

BETTER INSULATION SUPPORT

To correct pipe insulation disalignment and distortion and increase transmission efficiency, the American District Steam Co., North Tonawanda, N. Y., has designed a new insulation support which permanently holds the pipe covering concentric with the pipe. In explaining the features of the new support, the company points out that ordinarily the insulation hangs on the pipe. The weight of the insulation plus the weight of accumulated moisture gradually causes the covering to sag away from the pipe at the bottom and pull thin on top. This condition reduces the insulating effectiveness of the covering, with increasing heat losses as time goes on. With the Adsco support the pipe covering is cradled in wide brass bands. Each band is hung from a saddle which passes through the insulation and rests directly on the upper surface of the pipe. The new insulation supports are available in all standard pipe sizes up to 24 inches, and for 1½-inch, 2-inch and 3-inch covering.

GANG DRILL IS DESIGNED TO DO THE WORK OF 60 MEN

A gang drill for perforating pipe, developed by the Lebus Rotary Drill Works, which has plants in Electra and Willow Springs, Tex., does the work of 60 individual drills. The press is 36 feet long and contains 60 spindles which hold the bits in place. These spindles run off a geared head machine, and can hold any size drill up to 1¼-inch. The machine is powered by one 25 horsepower and one 10 horsepower electric motor. The smaller raises the pipe up to the drills and the other powers the spindles and drills.

A single drill, as formerly used by the company, took 8 to 12 hours to perforate one joint of 7-inch pipe with 1-inch centers, and the company was using two such presses for perforating work. With the new machine only 8 to 10 minutes is required to perforate a joint of pipe with 3-inch centers; 12 minutes for 2-inch centers; 25 to 30 minutes for 1½-inch centers, and 40 to 45 minutes for 1-inch centers. The patented drill chucks allow quick and easy changing of drills, and make it impossible for stems to turn in the chucks.

An automatic divider turns the pipe the desired distance as the drills are lifted and a new line of holes is to be cut. Water is played upon each drill from small tubes which extend from a pipe affixed to the press. Moving parts of the press run in an oil bath, and ball bearings only are used.

Pipe is now being perforated at the Willow Springs plant of the company and hauled to various parts of the field as ordered, but a warehouse will be erected in the Joiner area.

G. F. Lebus, inventor of some 30 oil-field tools, studied out this gang drill while driving from Longview to Electra, put men to work on the idea the next morning, giving his machinists sketches for the necessary parts, and completed the machine in 2½ months. The device will be put on the market later, according to the company.

MODEL 30 SCREW HOIST INTRODUCED BY WRIGHT

The new Wright Model 30 hoist, made by the Wright Manufacturing Co., Bridgeport, Conn., is light, compact and is recommended for general repair work where it must be continually carried about and operated in different places. It is adaptable for work on the horizontal such as moving heavy loads on rollers or skids.

Model 30 hoist is designed on the worm-wheel principle, is of few parts, and of extremely simple construction. It holds the load securely at any point.

Among points of merit enumerated by the manufacturer are: Special analysis steel load chains, electrically welded, heat treated and proof tested; heat-treated, drop-forged hooks; load chain guards which shroud the upper half of the load wheel and prevent the load chain from riding out of the load wheel pockets; non-fouling hand chain guide.

PROMAL FINDS LARGER FIELD OF USEFULNESS

Promal, which for four years has been made by the Link-Belt Co., Chicago, for use in its own chain products, is finding a demand from manufacturers of standard equipment. The reason is the characteristics of Promal combine great strength, resistance to wear, ductility and low production cost. The physical properties of Promal follow: Yield point, 50,000 pounds per square inch; ultimate strength, 70,000 pounds per square inch; fatigue strength, 33,000 pounds per square inch; elongation, 10 to 14 per cent in 2 inches; modulus of elasticity, 26,000,000; coefficient of thermal expansion, .0000109 inch; electrical conductivity, 211 ohms per 1,000,000 feet; magnetic permeability, 79 at 200 ampere turns; specific gravity, 7.35; average Brinell hardness, 170 to 190.

Promal is a specially processed malleable iron, the process employed transforming it into a material of radically different microstructure and physical properties. Patents have been allowed the Link-Belt Co. not only on the material itself but on the process of producing it. The name, Promal, is a registered trademark.

Promal can be heated repeatedly to a maximum of 1,000° F. and cooled without affecting its physical properties. This property makes it a desirable material for use on low-temperature heat-treating equipment, or for parts which are to be hot-dip galvanized. Promal is not the result of a skin-hardening process. It has a uniform structure throughout its cross-section, and its resistance to wear and abrasion continues after the surface is worn off. It does not depend for its production on arresting an annealing cycle at a certain point in cooling. The manufacture starts with a uniform raw material, which is uniformly treated, producing a uniform product. Promal is made at the Link-Belt Co.'s Ewart works, Indianapolis, Ind., where facilities have been increased to take care of the demand aside from the company's own chain requirements.

Natural Gas Industry Developments

USE OF NATURAL GAS DELAYED IN ILLINOIS

SPRINGFIELD, Ill., Nov. 9.—The use of natural gas from the line of the Panhandle Illinois Pipe Line Co. through central Illinois has again been deferred by a continuance by the Illinois Commerce Commission of cases involving gas rates in Springfield and about 30 other municipalities.

The petition of the municipalities to require the pipe line company to furnish detailed information concerning the cost of natural gas to be sold to local utilities was continued until November 17. A petition by the city of Springfield for a reduction in rates for artificial gas was continued until November 24.

The utilities, particularly the Illinois Power Co., serving Springfield, urged that the use of natural gas mixed with the artificial product be permitted immediately under rates proposed by the company, in order that consumers might receive the benefit of the lower schedules, but counsel for the city insisted that the use of natural gas should not be allowed until proper rates have been established.

The Illinois Power Co. has offered to reduce domestic rates in Springfield by 11.8 per cent and house heating rates by 38 per cent. The city claims the present rate for artificial gas should be reduced by 42 per cent.

MISSISSIPPI SEEKS GAS FRANCHISE TAX

GULFPORT, Miss., Nov. 9.—The Mississippi state tax collector has opened a campaign at Long Beach, west of Gulfport, for local taxation of the natural gas franchises of the Gulf cities division of the Southwestern Gas & Electric Co. of Shreveport, La., a subsidiary of the Middle West Utilities Co.

The town council of Long Beach unanimously adopted the assessment of $15,000 for the Southwestern company, spreading the figure over the three years from 1928 to 1930, for a total of $45,000 at an average tax rate of 26½ mills, exclusive of the county tax.

Deputy State Tax Collector Adams, who pressed the move for franchise taxation, said the Southwestern company had used a figure of $1,038,000 for its total investment in seeking favorable rates, but had paid in 1930 only $19,120 in property taxes.

Assessment meetings will be held in Pass Christian, Gulfport and Biloxi, and a hearing will be held before the Harrison county board of supervisors.

BORGER SUPPLY SHUT OFF

BORGER, Texas, Nov. 9.—Borger knows what it is to be in the dark. Oil lamps and coal oil stoves were pressed into service at the city hall. The town was without lights, gas or water.

The Panhandle Power and Light Co., after serving notice, cut off the city because of its failure to pay its utilities bills. Borger's bill, running from August, 1929, to September, 1931, was $16,689.43. The city recently issued a $7,500 warrant on the account.

The city commissioners recently launched a three-pointed attack on utilities rates, holding a gas rate hearing before representatives of the state railroad commission.

CHERRYVALE ELECTION

CHERRYVALE, Kan., Nov. 9.—Cherryvale voters rejected, 986 to 477, a gas franchise submitted by the Veeder Supply and Development Co. of Cherryvale in a special election. The franchise was submitted to replace the gas system of the Union Public Service Co.

ASSOCIATION HONORS THEODORE V. PURCELL

Theodore V. Purcell, vice president of the Peoples Gas Light & Coke Co., Chicago, Ill., received one of the highest honors of the gas industry when, at the

Theodore V. Purcell

convention of the American Gas Association, Atlantic City, N. J., he received the Charles A. Munroe award for pioneering and constructive leadership in rate making; for focusing attention upon gas sales development and crystallizing the gas industry's economic policies to this end. The award consists of an engrossed certificate and $500 in cash.

The award resulted from Mr. Purcell's studies in the development and application of business-getting gas rates; he has been prominently identified with the rate work of the association since its organization. Mr. Purcell was among the first to recognize that rate making is one of the principal functions of gas company management. His contributions in the form of rates, papers and addresses on the subject of rate making have been of great value to the industry. He is chairman of the Committee on Domestic Load Survey.

ENID SEEKS SUPPLY

The Enid, Okla., city commission has voted unanimously to seek another gas supply for Enid under a new franchise at a consumers' rate not to exceed 35 cents per 1,000 feet. The action followed a report by the Oklahoma Natural Gas Corp., present distributor, that it was unable to break a contract with the Consolidated Gas Co. to supply gas at a gate rate of 20 cents per 1,000. The city officials had demanded gas under the original 35-cent franchise rate instead of the present 45 cents. The Champlin Refining Co., it was said, has offered to furnish gas at the Enid gate at 12 cents per 1,000.

VOTE FOR CITY PLANT

PARSONS, Kan., Nov. 9.—The citizens of Altamont voted 175 to 28 to issue $20,000 in bonds for the establishment of a municipal gas system, the fuel to be purchased from a local field.

Under the plan, gas consumers are guaranteed a maximum charge of 50 cents, with no meter charge, in contrast with the present rate of 65 cents plus 75 cents monthly meter charge.

MOUNT PLEASANT LINE IS BEING REPLACED

MT. PLEASANT, Mich., Nov. 9.—Construction of an 11-mile natural gas pipe line between Mount Pleasant and the Vernon Gas Field was started some over a week ago by the Gas Corp. of Michigan.

Since September 1 the Gas Corp. of Michigan has been supplying natural gas to the towns of Clare, Rosebuch and Mount Pleasant. Natural gas from the Vernon Field is being used by the company, and is being conveyed through an old 2-inch line, formerly used by the company for distributing manufactured gas. Increased demands brought about by the change-over to natural gas has necessitated the construction of a larger line. The line now under construction is a 4-inch main.

About 50 men are under employment on the construction project which was let to the Frick-Reid Pipe Line Co. Two crews are working, one at each end of the right of way. It is expected that the line will be completed and ready for service in 30 days.

Pipe has been strung along most of the proposed route and several hundred joints of pipe already have been welded. Ditch digging with machine diggers also is proceeding at a rapid rate.

Besides the new line the company is also replacing virtually all mains in the city and making other necessary hookups to provide consumers with the best possible service.

The 11-mile new line will be built along the route of the old 2-inch main, which runs about straight north from Mount Pleasant.

Rumors were being circulated during the week that a Muskegon concern is contemplating the building of a natural gas line from the Bloomfield Township, Isabella County Gas Field to Muskegon.

Surveyors working in the village of Remus were reported to have said that they were surveying a right of way for a gas line from Broomfield to Muskegon. The surveyors' statement apparently were the only basis for the rumor, which has not been substantiated from any other source.

OHIO OIL CO. TO GET FRANCHISE IN CRAIG

DENVER, Colo., Nov. 9.—Craig Colo., has ordered an ordinance printed granting a franchise for a natural gas distributing system to the Ohio Oil Co. The ordinance comes up for final reading before the town board on November 11, when it is expected it will be approved. There was another applicant for the franchise, A. J. Hardendorf of the Colorado Eastern Gas Co. of Denver.

The Ohio Gas Co. controls acreage on a structure about four miles northeast of Craig. The company proposes to start a well on this structure immediately. Drilling rig and equipment will be moved at once from the Powder Wash structure, 55 miles northwest of Craig, to the Craig structure. Gas horizon on the Craig structure is expected around 2,800 feet.

In the event of the discovery of gas, a trunk line will be laid immediately to Craig and the distributing system installed for the town.

IN WASHINGTON STATE

Natural gas service for the towns of Pasco and Kennewick, Wash., is planned by Northwestern Natural Gas Co., which expects to extend its lines to these communities this fall. Franchises for gas service have been granted to this company in Walla Walla, Toppenish, Wapato, Zillah and Granger.

KANSAS COMMISSION HEARS GAS TESTIMONY

TOPEKA, Kans., Nov. 9.—An employe of the Cities Service Co. organization testified before the Kansas Public Service Commission the cost of reconstructing the gas pipe line system owned by subsidiaries of the company would be "substantially the same" now as it would have been five years ago.

The opinion was given by F. M. Cropper, engineer employed by a Cities Service unit, Henry L. Doherty & Co., under cross examination at the commission's hearing into reasonableness of the 40-cent city gate rate charged to the organization's local gas distributing companies and other expenses entering into charges paid by consumers of the fuel.

Mr. Cropper and other Doherty engineers previously had testified in support of a valuation of nearly $100,000,000 which the concern has placed on certain pipe line properties of the Cities Service organization.

Reproduction cost, new, of the properties of the Cities Service Gas Co., the Cities Service Gas Pipe Line Co., and the American Pipe Line Co., was placed at $99,202,072, against a "present value" of $92,943,213.

The valuation figures, contained in a bulky exhibit presented to the commission last month at a preliminary hearing, were stated to cover all physical assets of the three affiliated concerns except leaseholds and gas reserves.

LOUISIANA TOWN WINS CASE FOR CITY PLANT

RUSTON, La., Nov. 9.—The city of Ruston has won its court fight for the right to construct a natural gas distribution system to be operated by the municipality. A suit brought by the Peoples Gas & Fuel Co., a Shreveport firm, was decided in favor of the city by Judge E. L. Walker in district court. The gas company claimed that the city's proposed action was, in effect, confiscation of the plaintiff's property, and contended the city council was without authority to call an election, which several months ago resulted in the voting of a bond issue for $180,000 with which to construct the municipal gas system.

The plan of the Ruston city council is to construct a pipe line from the Monroe gas field, build a compressor station and lay mains for municipal distribution of natural gas.

In the decision, Judge Walker said in part:

"When the plaintiff acquired the franchise under which it is operating and doing business, it did so with knowledge of the limitation placed upon said franchise by the laws of Louisiana, and, having such knowledge, it may be said that these limitations became a part and parcel of the plaintiff's contract with the town of Ruston. That being the case, plaintiff is not in any position to plead estoppel against the town from going into the gas business in direct competition with plaintiff.

"Plaintiff's petition does not disclose a legal cause of action."

BRITISH COLUMBIA GAS

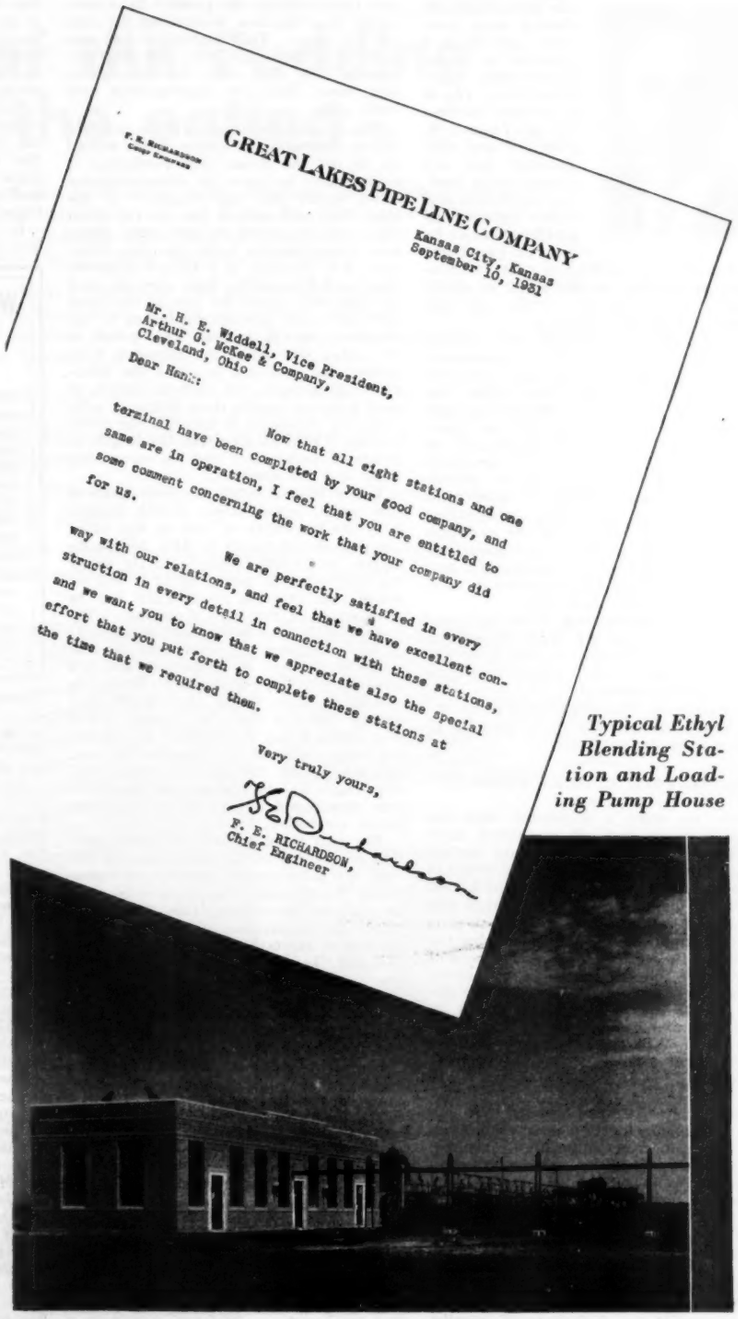
CHATHAM, Ontario, Nov. 9.—B. C. Power Corp. of Vancouver, which holds exclusive rights for the sale of gas on Vancouver Island and the lower mainland of British Columbia, is reported negotiating to handle any production developed by companies now drilling in the Fraser Valley and Lulu Island areas. In the latter district, International Pipe Lines Co. had drilled four wells and secured some production, and has 100,000 acres under lease for further development.

PIPE LINE IN THE WORLD

COMPLETION of the 1400-mile gasoline pipe line of the Great Lakes Pipe Line Company from Ponca City, Oklahoma, to Chicago via Barnsdall, Kansas City, Des Moines and to the Twin Cities has written a new chapter in the history of gasoline transportation.

This gasoline pipe line, the longest in the world, was constructed and operating in 12 months after the surveying work was started in the summer of 1930.

Arthur G. McKee & Company's part in the building of this project included complete construction of all pumping stations, installation of equipment, piping at tank farms and all manifolds, from Des Moines east to Chicago and north to St. Paul. . . . Terminal facilities were constructed by Arthur G. McKee & Company at Des Moines, including pumping station, ethyl blending station, loading racks and tank farm.



GREAT LAKES PIPE LINE COMPANY

Kansas City, Kansas
September 10, 1931

Mr. H. E. Widdell, Vice President,
Arthur G. McKee & Company,
Cleveland, Ohio

Dear Hank:

Now that all eight stations and one terminal have been completed by your good company, and same are in operation, I feel that you are entitled to some comment concerning the work that your company did for us.

We are perfectly satisfied in every way with our relations, and feel that we have excellent construction in every detail in connection with these stations, and we want you to know that we appreciate also the special effort that you put forth to complete these stations at the time that we required them.

Very truly yours,

F. E. RICHARDSON,
Chief Engineer

Typical Ethyl Blending Station and Loading Pump House

ARTHUR G. McKEE & COMPANY

Engineers and Contractors **2422 Euclid Avenue, Cleveland, Ohio**

120 Broadway, New York · Bush, House Aldwych, W. C. 2, London

ASSOCIATED WITH

PETROLEUM ENGINEERING, INC.
Tulsa, Oklahoma · Dallas, Texas

THE WHESSOE FOUNDRY & ENGINEERING CO., LTD.
Darlington, England · 25 Victoria Street, S. W. 1, London

Field Problems and Their Solution

EDITED BY THOMAS F. SMILEY

In order that men connected with the drilling, producing and transporting branches of the petroleum industry may procure quickly a solution of many problems confronting them from time to time in their work, The Oil and Gas Journal has arranged with leading engineers and other recognized authorities to answer questions submitted by readers of this publication pertaining to the work of drilling and producing crude oil and transporting this product.

Everyone is invited to submit questions freely. These questions will be submitted to proper authorities by Mr. Smiley, who edits the page, and answers, based on the best available information, will be published. Each question should give as much detail as possible, especially where it relates to matters where depths of sands, types of sands and operations on adjoining properties would have a bearing on the problem involved. The source of all questions will be considered as confidential and only initials will be published in connection with the question.

In this connection, The Oil and Gas Journal will be glad to publish articles from field men who have devised new methods or practices which are improvements.

In case an immediate answer is important, one will be given by mail if the writer requests it.

SWING PIPE OFFERS PROBLEM

We are using a 55,000-bbl. tank for storing heavy fuel oil containing large percentages of b.s., water and asphaltenes. The tank is 30 feet high and 114 feet in diameter. The material in it consists of numerous fuel oils which will not blend homogeneously. Now then is there a simple method of determining the distance the end of the swing pipe will rise from the horizontal as the swing pipe line is wound on the winch at the top of the tank? The swing pipe is 30 feet long and it describes an arc within the tank. Will the swing pipe pick up more oil or less oil at various heights? —R. E. G.

There is no simple formula that can be worked out for this problem, according to engineering authorities consulted, because there will be a variable corresponding to the change in length of the chord of the arc as the pipe is moved. If the line is fastened at the end of the 30-foot swing pipe the swing pipe line will approximately form the chord of the arc of the circle through which the end of the pipe will move.

As the pipe is 30 feet long, the circumference of the circle it could describe will be 188.496 feet. As the pipe can move through only one-fourth of this total circle, the arc it will describe will be about one-fourth of 188.496 feet, or 47.124 feet.

The swing pipe line is wound upon a winch drum and the size of the line and diameter of the drum will cause the length of line wound on or off at each revolution of the crank to vary, but this small change can be neglected in the general problem, although it should be considered if accuracy is required. To determine drum capacity, A. Leschen & Sons Rope Co. give this simple formula:

Add the depth of the flange to the diameter of drum in inches. Multiply the sum of those dimensions by the depth of the flange. Multiply the result by the width of the drum between the flanges and then multiply the product by a multiplier that has been worked out for each size of rope. This multiplier for one-half inch rope is 1.05; for nine-sixteenths inch rope, .828; for five-eighths inch rope, .672; for three-quarter inch rope, .465.

The above formula gives drum capacity and to determine the length of line wound on or off the drum each revolution it is necessary to know the drum diameter when empty and the diameter of the line. For each coil of line on the drum there will be added to this drum diameter approximately twice the line diameter. For instance, if a 16-inch diameter drum and five-eighths inch wire are used the first coil across the face of the drum will add twice five-eighths inches to the diameter, or 1¼ inches. This added to 16 inches will make the diameter 17¼ inches. As each coil is added the diameter will increase. To find the length of each wrap of line in these different coils it is only necessary to multiply the diameter by 3.1416 to ascertain the length in inches if inches are used in computing drum and line diameter.

For a 16-inch drum the first wrap of line would equal about 50.625 inches; with the one wrap of line on the drum the second coil would be 17¼ inches diameter or 54.192 inches long. By dividing the length in inches by 12 it will be found that there is about 4.218 feet in each wrap on the bare drum and 4.516 feet in each wrap on the second coil. It is next necessary to reduce the decimal parts of the feet to inches and for this purpose a table can be used. By using this table it is found that 4.218 feet equals about 4 feet 2⅝ inches; 4.516 feet equals 4 feet 6 7/16 inches. By following such a method it is possible to work out the details for any size drum and any length line to compute the length of line unwrapped or wound in for each crank revolution.

The next thing to find out is the position of the end of the swing pipe in the tank as it is moved upward or downward. To calculate this we take the axis or shaft of the winch drum as a fixed point. Let us suppose this is 5 feet from the edge of the tank roof and 2 feet above the roof. Let us suppose that it is 40 feet from this shaft to the end of the swing pipe as the pipe lies horizontally. For convenience in working out the problem it will be found advisable to draw a sketch showing these conditions and to indicate the depth of the tank by lines across it at 4-foot intervals (these of course drawn to scale).

The next step is to draw in the sketch other lines from the fixed point on the roof (the winch shaft) to the points where the depth lines intersect the arc described by the end of the pipe in its upward movement. These lines then may be measured with a scale and the length of line paid out is found and placed opposite the point for the various depths in the tank.

From such a sketch the following table may be made covering the conditions described:

Distance above horizontal (feet)	Length of line (feet)	Difference in length (feet)	Difference accumulative (feet)
0	40.0	0	0
4	37.0	3	3
8	34.0	3	6
12	30.0	3	9
16	26.0	4	13
20	21.0	5	18
24	15.0	6	24
28	6.5	8½	32½

From this it will be seen that the movement with relation to the depth of the end of the swing pipe in oil or its height above the horizontal position and the length of swing pipe line paid out is not a constant, and to ascertain the exact relation between these two factors would require the use of higher mathematics.

The problem is still unfinished so far as it concerns translating the lengh of line wound or unwound into revolutions of the crank on the winch and as it concerns the position of the end of the swing pipe, for the variation in the diameter of the coil of wire rope on the winch drum introduces another variable.

You will realize that this is a rather complicated problem and subject to varying conditions and the simplest way to find out what you want to know is to place the end of the swing pipe in several positions in the tank and then tie flags on the line to correspond to them.

In the foregoing calculations it has been assumed that the swing pipe line is fastened at the end of the swing pipe. If it is in any other position on the swing pipe the conditions are changed further and the figures given here cannot be used.

As to the question whether the movement of the end of the swing pipe will vary the suction pickup: In the first place there is no suction at the end of the swing pipe, for the oil is running down at all times to the pipe line outlet, and is therefore under a varying head.

The actual head that is effective at the pipe line connection near the bottom of the tank is always equal to the depth of the oil in the tank above the pipe line level, the specific gravity of the oil, temperature and barometric pressure. If exact calculations were desired the friction in the pipe end and in the swing might be taken into consideration, also the type of orifice through which the oil escaped.

The simple way to figure the pressure at the pipe line opening is first to measure upward from the bottom of the tank to the center of that opening. Next gauge the depth of oil in the tank and subtract the height of the pipe line connection from this measurement to get the net depth of the oil that can flow out of the tank by gravity.

Let us assume that in a tank 30 feet high the pipe line opening is 18 inches off bottom. In gauging it is found that there is 28 feet of oil in the tank. This leaves 26 feet 6 inches of oil above pipe line level.

Next the gravity of the oil must be known and from the conversion table its specific gravity can be ascertained at 60° F. Assume that 35 A.P.I. gravity oil is in the tank. This has a specific gravity of .8498 as compared with water which has a gravity of 1.00 at 62° F. There are some slight variations in this standard, but for practical purposes it is correct.

Water has a weight of .433 pounds per square inch for each foot of height. Therefore if the tank were full of water and the foregoing measurement were taken to find the pressure exerted by this column of water at the pipe line opening it would be necessary to multiply 26.5 feet by .433 pounds which equals 11.4745 pounds per square inch.

Knowing the weight of the column of water, to find the relative weight of a column of oil it is necessary to multiply the water pressure by the specific gravity of the oil. In this case the water is 11.4745 and the oil .8499, which give the weight of the oil column as 9.75 pounds at the pipe level when the gauge in the tank is 28 feet total.

As the end of the swing pipe is lowered this pressure will decline gradually to zero, when the pipe is level and no oil will run to the pipe line connection by gravity. It is possible that oil can be sucked out below the horizontal position of the swing pipe, but that is another problem.

The position of the swing pipe in the oil has nothing to do with the pressure at the pipe line connection because it is assumed that the swing pipe is full of oil at all times and the true pressure at the pipe line connection depends on the head of oil, not on the position of the swing pipe. In other words, if the swing pipe were removed and the oil flowed out through a hole in the tank at pipe line level the rate of flow would vary as the depth of oil within the tank was lowered.

On page 93 of the June 27, 1929, issue of The Oil and Gas Journal (Field Problems and Their Solution) will be found the answer to a problem dealing with the rate of flow of oil through an open pipe from a 55,000-bbl. steel tank full of oil. This formula could be applied to your problem if friction through swing pipe and connections is ignored and would indicate the approximate time required to empty a tank if the additional rate of flow caused by suction on the pipe line is ignored.

You probably have in mind two conditions in emptying a tank; one dealing with the rate of natural flow owing to head of oil in the tank and the other the rate of flow owing to pumping oil out of the tank. The first can be solved by the use of the formula referred to above. The second is calculated best from the pump displacement with such allowances as may be necessary to take care of slippage and length of line between tank and pump.

From the foregoing you will see that to make a table to cover all the things your question involves is next to impossible and pipe line gaugers prefer to rely upon a few simple facts which they can obtain at the tank and upon their previous experience in running oil rather than try to compute tables and formulas that are subject to so many variables as to make them difficult to handle.

WHY WAS IT CALLED THAT?

MOONLIGHTER

Moonlighters were bootleggers of the torpedo business in the early days of oil. Col. E. A. L. Roberts, inventor of the oil-well torpedo which bore his name, held a patent on the device, but illicit shooters were numerous, and owing to the common practice of doing their work at night they came to be referred to as moonlighters. Many stories are told of spotters being recognized and spirited away till after the illegal shooting had been performed, thus frustrating plans to obtain evidence on which to base infringement suits.

DEEPEST CABLE-TOOL WELL

Will you please tell me the deepest well in the world which was drilled from top to bottom with cable tools? Please tell me the location of the well and any other data you may have. Our company is drilling a cable-tool hole, the depth of which to date is 7,800 feet. A string of 6⅝-inch casing was successfully set at 6,886 feet in a dry hole.—G. W. L.

The deepest well drilled entirely with cable tools of which this department has a record is the Big Lake Oil Co.'s No. 3-C University, in the Big Lake Pool, Reagan County, Texas. The top of the pay was found at 8,380 feet and the well flowed 36 bbls. in 36 hours before being shut in at its total depth of 8,540 feet.

Within 15 feet of being as deep as the Big Lake Oil Co.'s No. 3-C University is the Texon Oil & Land Co.'s No. 1-B University in the same field. It also was drilled with cable tools and at 8,525 feet it produced 676 bbls. of oil and 10,547,000 feet of gas.

STRAIGHT FACTS

The 22nd of a Series and the 5th advertisement on Sucker Rods

Proof of the Pudding lies in the eating . . . .

CONTROLLED PROCESSES

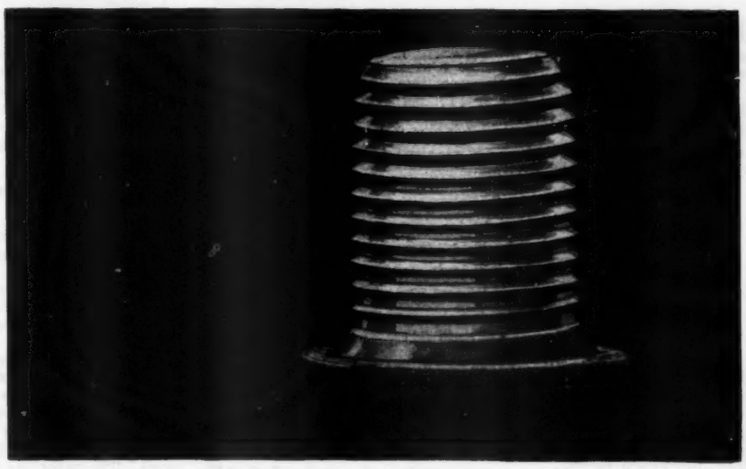
From selected heats of the best alloy steel meeting established physical and chemical standards and properly rolled, Axelson rod stock combines all desirable features, namely: strength, elasticity and ductility. Tested metallurgically and chemically, it offers the ultimate fatigue resistance.

Forged under uniform heat conditions and automatic control, Axelson upset pin ends must have correct flow lines. The increased diameter of the rod just below the forged end retards the possibility of fracture at that point most highly subjected to excessive bending stresses.

To relieve forging stresses, to refine the grain structure and to lengthen their service life, Axelson rods are scientifically heat-treated by the most modern methods. Each phase of this heat-treatment is automatically governed by recording and controlling pyrometers.

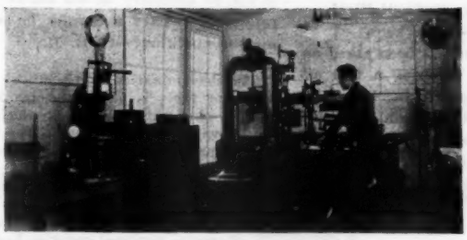
Precision machined to A.P.I. tolerances, every Axelson pin end is subjected to 17 rigid inspections prior to shipment.

Thirty years of experience in sucker rod manufacture, years filled with research, experiments and development stand behind each Axelson Sucker Rod.



Specimens are subjected to shock test on the Olsen-Izod.

Brinnel and Rockwell harness testers determine the grain structure.



Rods are tested for ultimate strength by an Olsen tensile testing machine.

Read These Records

Axelson Rods installed October 24, 1930
Tubed to 7020'
Tubing 2½"
Pump—Axelson 2½" Traveling Tube Insert Cup Pump.
Production—360 barrels per day.
One Pin break to date.

Axelson Rods installed December 12, 1930
Tubed to 6500'
Tubing 2½"
Pump—2½" Axelson Traveling Tube Insert Cup.
Production—150 barrels per day.
No breaks to date.

AXELSON SUCKER RODS

Axelson Manufacturing Co.,
P. O. Box 710, Vernon, Sta., Los Angeles
Tulsa St. Louis
New York City, 30 Church St.
Mid-Continent and Eastern Distributors:
Frick-Reid Supply Corporation

Technical Questions Answered

BY CHARLES K. FRANCIS, PH.D., TECHNICAL EDITOR

This department of The Oil and Gas Journal is devoted to the manufacturing branches of the oil industry.

Those connected with the refining of crude petroleum, the manufacture of natural gasoline and closely allied industries are invited to submit their problems to Dr. C. K. Francis, technical editor. The department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in the various phases of plant operation; also those connected with the marketing and utilization of petroleum products.

Questions should be submitted in as much detail as possible so as to assure a satisfactory answer.

All inquiries should be signed and if other than the given initials are to be used please indicate the desired letters.

Questions involving patented processes, intricate formulas, and calculations and estimates of costs, for obvious reasons, cannot be answered. The replies will appear on this page within a reasonable time.

SPECIFIC HEAT AND SPECIFIC VOLUME

I would be pleased if you will give me or advise where I can find the specific volumes and the specific heats of the compounds found in crude petroleum?—D. C. A.

The specific volume of any liquid is, for scientific purposes, the volume, measin cc., occupied by 1 gram of the substance under standard conditions of temperature and pressure. The U. S. Bureau of Standards has prepared in Circular 154 a table, Table 2, for reducing oil volumes to the basis of 60° F. The coefficients of expansion are selected for each group according to A.P.I. gravity as explained in the table following.

UNIT VOLUMES PETROLEUM LIQUIDS

Group—	Coefficient of expansion	Corresponding A.P.I. °	Group range A.P.I. at 60°F.
1.....	0.0004	22	Up to 34.9
2..	.0005	44	35-50.9
3.....	.0006	58	51-63.9
4.....	.0007	72	64-78.9
5.....	.0008	86	79-88.9
6.....	.00085	91	89 and higher

The table gives the multipliers for converting the volume at the indicated temperature and A.P.I. degrees to 60° F. For example, if the A.P.I. gravity of an oil at 60° F. is 22° and the volume at 105° F. is 5,600 gallons, then the volume at 60° F. is 5,600 × 0.9822, or 5,510.23 gallons. Other information may be obtained from National Standard Petroleum Oil Tables, Bureau of Standards Cir. 154, which may be purchased from the Government Printing Office, Washington, D. C., for 30 cents.

The specific heat of a substance is the number of heat units required to heat a unit weight through 1°. Some authorities prefer to call it the coefficient of thermal capacity. Another definition is: The ratio of the number of heat units used to raise the temperature of the substance 1°, divided by the number of units required to raise the equivalent weight of water at 60° F. 1°. If 1 pound of pure water is the standard, the mean specific heat over a temperature range 32° to 212°, or 180th part of the heat from 32° to 212°, from the definition of a B.t.u., is unity. In commercial and industrial work frequent use is made of specific heats on the basis of the pound as the unit of weight.

The range of specific heats for most petroleum products is from 0.45 to 0.60, and the specific heat of crude petroleum is 0.45 as an average.

The specific heat increases with temperature, as illustrated by the data of Bailey and Edwards, in Ind. Eng. Chem. 12, 891; 1920.

SPECIFIC HEAT AND TEMPERATURE
(Heavy mineral oil)

Temp. ° C.—	Specific heat
50	0.476
120-140	.543
140-160	.565
160-180	.577
180-200	.591
215-235	.635

The specific heat tends to increase with the weight of the product as shown by the examination of the petroleum fractions.

SPECIFIC HEAT PETROLEUM FRACTIONS

Fraction—	Specific heat
Gasoline	0.475
Kerosene	.490
Gas oil	.500
Lubricating oil	.510
Wax	.570
Fuel oil	.550

If the chemical composition is known, specific heat may be calculated: The percentages of carbon, hydrogen and oxygen are divided by the respective atomic weights, and these quotients multiplied by the atomic heats (C=1.8; H=2.3; O=4.0).

Some of the values may be given for the paraffin hydrocarbons:

SPECIFIC HEAT PARAFFIN HYDROCARBONS

Hydrocarbon—	Specific heat
Methane	0.593
Ethane	.505
Propane	.473
Butane	.462
Pentane	.448
Hexane	.442
Heptane	.487
Octane	.511
Nonane	.503
Decane	.506
Hexadecane	.496

Methods for the determination of specific heat, and related information, may be found in American Petroleum Industry, Bacon and Hamor; Handbook of the Petroleum Industry, D. T. Day; Petroleum and Its Products, W. A. Gruse; Petroleum Technology, Gurwitsch-Moore.

BENZOL FROM PETROLEUM

The writer's opinion has been asked on the practicability of cracking a fuel oil or crude oil and manufacturing benzol by the * * * process. I am not familiar with this process but understand that it involves heating of the oil and gases under a pressure of 100 pounds and a temperature over 1,000° F. It is claimed that about 40 per cent benzol may be recovered from a topped crude such as East Texas crude oil. Your opinion would be appreciated as to the practicability and whether it would be profitable operating on the oil after the removal of gasoline—C. C.

Small quantities of the aromatic hydrocarbons are found in the distillates from most petroleums and there are a few oils which yield appreciable quantities, especially noteworthy in this respect are the heavy oils found in Java, Borneo and Rumania. Some Mid-Continent and California oils yield hydrocarbons of the naphthalene series when the vapors are heated to about 900° F. The Borneo oils have been reported to yield a total of 40 per cent aromatic substances.

Oils of the paraffin type seldom yield more than a few per cent of benzol, except under high temperature and pressure conditions of distillation. The low yield and the high gas loss, with the deposition of carbon, are factors that would have to be reduced if a process for the manufacture of benzol were to be successful. The purification expense of benzol made from petroleum would no doubt be high. There was some benzol made from petroleum during the war, the venture being encouraged by the demand and the prevailing price. It does not seem reasonable that any process for making benzol from petroleum could be expected to yield commercial quantities and at low enough cost to compete with the coal tar product at this time.

The common source of benzol is coal tar or coal tar distillates. There are many descriptions of the process in the literature, but the investigation of a coal tar naphtha, solvent naphtha, by Egloff and Moore, Ind. and Eng. Chem., 9, 40; 1917, may be of special interest. When this solvent naphtha was heated to 800° C., 1,472° F., the yield of benzol was 15.9 per cent.

"Upon the basis of 100 gals. of oil used the percentage yield of toluol exceeds that of benzol by 4.7 per cent. The maximum yield of 20.6 per cent of toluol occurred at 750° C., whereas at 800° C. benzol showed a maximum of 15.9 per cent. The critical temperature of maximum formation for toluene occurs between the temperatures of 750 and 800° C. Between these temperature limits a drop of 14.1 per cent of toluol is to be noted. This fact indicates the temperature control necessary when maximum conditions are required for a particular hydrocarbon."

DETERMINING OCTANE NUMBER AND CRACKING

Since the inception of the new motor fuel specification in octane numbers evidently there is some new apparatus on the market for the determination of this rating other than the customary method of distillation. What apparatus is necessary for the determination of the octane rating of a motor fuel? Due to the concentration of the fraternity on the new octane rating of a motor fuel, will it not be necessary in the future for all refineries to have a cracker in order to meet competition?—G. B. M.

The determination of the knock rating of motor fuels is made in some kind of engine, observing the knock and matching it with some standard. There have been numerous designs proposed and used for this purpose but only recently has there been any tendency for the authorities to agree on a particular engine and standard method for making the test. All interested national societies have been represented on the co-operative fuel research steering committee which has accepted an especially built engine for determining the knock rating of gasoline, the results being expressed in octane numbers, as a tentative standard.

This engine was briefly described, together with the method, on this page in the October 15 issue, and further details may be obtained from the articles published in the Society of Automotive Engineers Journal for June, July and August.

The selling price of gasoline has been such that for some years the refiner could not afford to manufacture gasoline without cracking equipment; because the cracking process enables him to materially increase the yield of gasoline and gasoline has, for ever 20 years, been the most important petroleum product. There has been an ever-increasing demand and the price obtained for it during the greater part of this period has enabled the refiner to operate at a profit. Without the cracking still there would not have been enough gasoline produced to meet the market demand.

It was early recognized, although not understood, that cracked gasoline contained something to make it a better motor fuel than the straightrun product and we now know that it is the presence in the cracked gasoline of certain substances, which function to reduce the combustion knock, that is responsible for the smooth running of the motor.

The motorist has come to appreciate the knockless gasoline. The automobile manufacturer has built his engine to operate at its best on high antiknock gasoline. The scientific societies have perfected methods for determining knock rating and a scheme for expressing it in terms of octane numbers has been generally accepted. A high knock rating for gasoline is recognized as a desirable property. Just how far it will be economically possible for the refiner to go in approaching the 100 per cent knockless gasoline is not known. The present standard for a prominent premium gasoline is 74 octane number. Some refiners state that a part of their cracked gasoline will test 87 octane number, making it possible for a final blend to be marketed having an octane rating of 70. A widely distributed nonpremium gasoline is reported to test 57 octane number.

METHANE AS A REDUCING AGENT

Has anything of an industrial scale been done in making use of natural gas or methane, as a reducing agent in metallurgical plants?—T. E. V.

The composition of natural gas, essentially methane, has suggested its use for some smelting work and experiments have been made in which efforts were made to replace coke and carbon with natural gas. A discussion of the subject was presented by C. G. Maier, before the recent meeting of the American Chemical Society, September 1, at Buffalo, N. Y., in his paper, "Methane as a Metallurgic Reagent." The paper has not been published, but his conclusions, as presented, are quoted:

"Obvious economic advantages in the use of methane as reducer are apparent from simple considerations of the stoichiometric relations of the reduction reactions in relation to the cost of methane. Less obvious advantages depend on the lower temperatures utilizable with methane as compared to solid carbon as reductant. It may be generally assumed that elementary carbon reacts with solid oxides through the producer gas reaction $C+CO_2=2CO$, and many experimenters have shown this latter to be slow below 1,000° C. Methane reductions become thermodynamically possible and appreciable in rate at temperatures not greatly above 800° C. The considerable number of experimental projects now in progress at smelting or chemical plants looking toward the metallurgical uses of natural gas seem certain to result in considerable development in this field in the next few years. Such projects will probably not be successful until reduction units are specially designed to suit the pecularities of methane reactions. Attempts at direct substitution of methane for other reducing media will probably prove futile."

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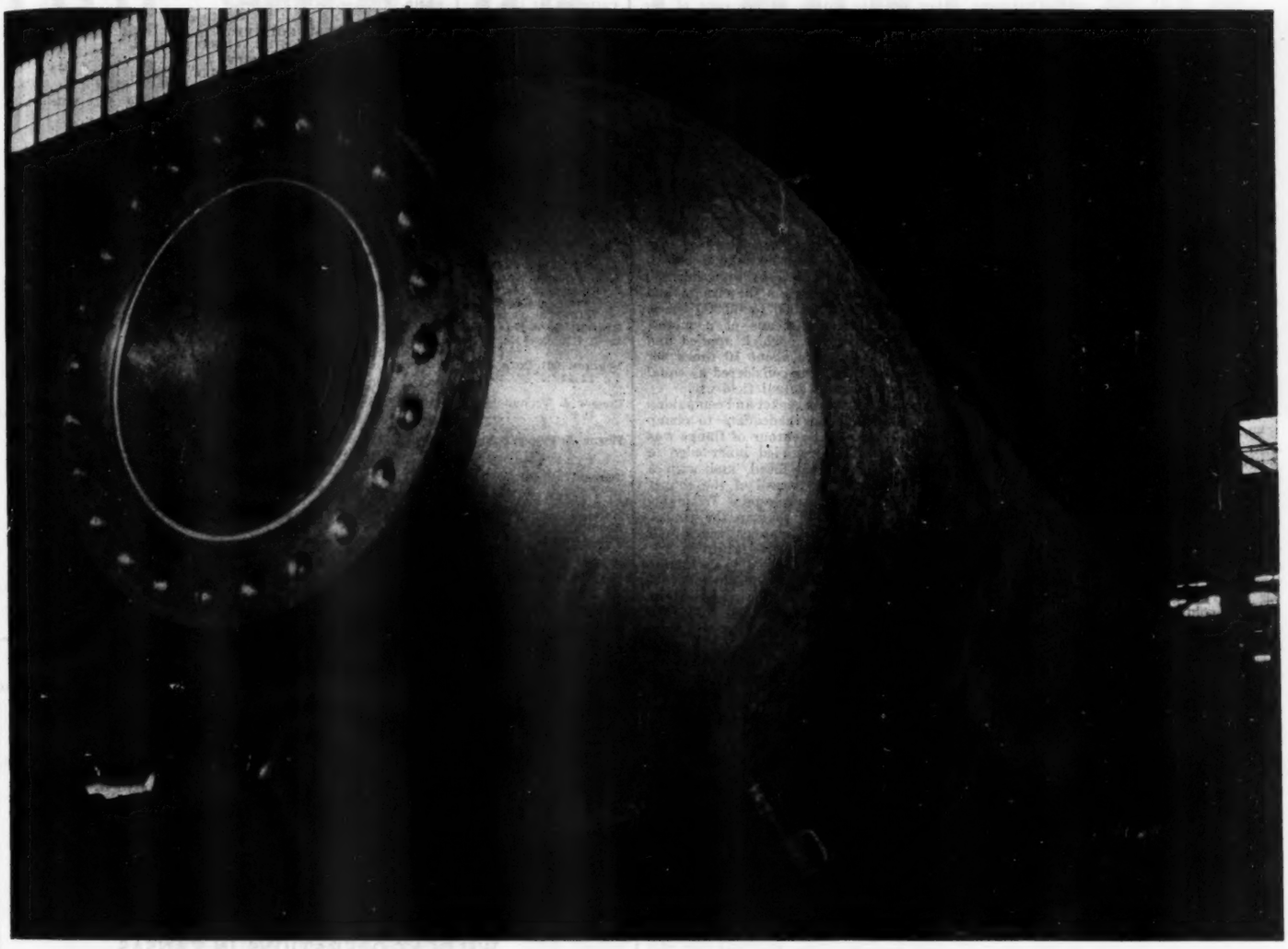

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SAFETY BLOWOUT HEAD IS DEVISED FOR VESSELS WITH HIGH PRESSURE

With the development of the Oklahoma City Field and other areas where high rock pressures have been found accompanied by large volumes of gas it has become quite a problem to provide equipment at the well head for handling the oil and gas safely. While it is possible to build vessels that are strong enough to handle these high pressures there are limits in design and class of material that can be used commercially and it therefore resolves itself into a problem of supplying the vessels with some type of relief opening that will act quickly and efficiently if excessive pressures are encountered.

Black, Sivalls & Bryson, Inc., Bartlesville, Okla., have recognized this situation, and G. Raymond, manager, has recently issued a report upon the results they have obtained in these experiments and on a test of an oil and gas separator fitted with their new type blowout head made at the Oklahoma City plant of the American Tank & Equipment Corp. on October 29.

The results obtained at this test were quite satisfying. A riveted vessel failed at about 2,100 pounds pressure while one that had been welded failed at about 2,700 pounds pressure. It is planned to again run the tests in Tulsa soon.

In their study of the many phases of the problem of handling high pressure and large volume wells it was developed that pressures as high as 2,500 pounds per square inch had to be taken care of and the volume of gas varied from 50,000,000 to as high as 200,000,000 feet per day. While these conditions were new to the industry when the Oklahoma City Field was opened, the prospects of having to develop future oil fields at depths below 6,000 feet makes it quite probable that there will be new areas opened where conditions of this kind will again be found.

It has been the common practice to equip oil and gas separators with pop valves, but Black, Sivalls & Bryson engineers found that a 4-inch diameter pop valve of the common type operating at 150 pounds per square inch could only handle 4,000,000 feet of gas per day and for a 7x24-foot separator operating on a typical 50,000,000-foot gas well it would require not less than 12 pop valves of that size.

There are a number of other mechanical details to be considered in using pop valves and while they do not recommend that they be discarded entirely it has been decided that some other method of providing quick and sure relief for the entire production of the well must be placed in the vessel.

After much experimenting, Black, Sivalls & Bryson have finally devised a stamped head of semielliptical contour, of thin copper, which is completely shattered when dangerous pressures are reached in the oil and gas separator and do not cause sparks. These copper relief plates can easily be replaced and the many tests that have been made in developing and applying them show that they operate within 10 per cent of the predetermined pressure.

In the experiments it was also developed that the copper blowout plates could be subjected to the usual conditions found in the field in so far as fatigue resistance is concerned because it was realized that a plate might act in the desired manner when first installed and tested, but after years of use many conditions would change and if these changes affected the character of the metal in any way the vessels might still be dangerous.

It was therefore determined by running a series of tests consisting of subjecting a copper head to 50,000 repetitions of working stress by applying 150 pounds of air through a diaphragm and relieving it from 50,000 to 60,000 times. This was done by means of a motor-driven two-way valve which applied and relieved the pressure about 10 times per minute. This test was considered as equal to several years of actual field use.

During these tests gasket and companion flanges were found inadequate to clamp the head. A special contour of flange was developed with a rounded inner edge to prevent shear of the head, and with a metal-to-metal seat formed of the copper to the steel at an acute angle. With this flange it is possible to grip the copper head leak-tight in a manner which will not distort it nor affect its failure.

Tests were also conducted to determine the reaction of such a sudden relief of internal pressure upon the vessel itself and it was proven quite conclusively that no damage was done to the vessel by the explosion of the relief head.

It is not felt that the safety head described should be substituted for pop safety valves, but should be used in addition thereto. On separators, pop safety valves set at the working pressure of the system should be used. These safety valves will give warning of excess pressure, so that action by the operators can be taken immediately and the safety head will assure that harmless relief will be given straight into the air if the operators are not quick enough.

Black, Sivalls & Bryson hope that their development of this safety head will contribute measurably toward the safety of oil field operations. Their rather complete studies have produced a head which can be expected to fail at a predetermined pressure either the first day the vessel is in use or after the vessel has been fatigued by many thousands of repetitions of stresses. The failure of the head can open a free area large enough to relieve the entire flow from any well. The failure cannot cause sparks. The material used is corrosion resistant. The head upon failure blows into small bits which do not form a hazard to anyone standing about. The head can be easily renewed after failure. The head does not produce destructive reactions to the vessel.

Black, Sivalls & Bryson are indeed anxious to receive the comments and suggestions of the oil fraternity upon this development.

WILDCAT OPERATIONS IN OKLAHOMA

(Continued from Page 54)

GARVIN COUNTY

Malarnee et al's No. 1 Phillips, NE SW SE Sec. 24-2-2w...S.D. 4,830 ft.

GREER COUNTY

Dovell et al's No. 1 Capell, NW cor. Sec. 1-7-22w .....5,000,000 ft. gas 1,455-65 ft; T.D. 1,760 ft.

French's No. 1 Murphy, SW NW Sec. 23-7-21w .....S.D. 1,645 ft.

HARPER COUNTY

Sinclair O. & G. Co.'s No. 1 Howell, C SW SW, Sec. 14-26-24w .....20,000,000 ft. gas 5,350-5,400 ft; T.D. 8,539 ft; S.D; sprayed 50 bbls. gasoline.

HASKELL COUNTY

Ault et al's No. Harrison, CWL SE NE, Sec. 14-9-19...S.D. 650 ft.
Ault et al's No. 1 Hall, NW SW SW, Sec. 14-9-19 .....S.D. 2,000 ft.
Ault et al's No. 1 Hall, SE NW, Sec. 25-19-9 .....S.D. 200 ft.
Holden's No. 1 Phillips, SE cor., Sec. 2-9-18e .....S.D. 1,860 ft.
Marion Oil's No. 1 Sanders, NW NE NW, Sec. 16-9-18e...S.D. 2,387 ft.

KAY COUNTY

Lewis et al's No. 1 Harris, SE NW, Sec. 14-26-1 .....Location.
Mummert Drlg. Co. et al's No. 1 Cormick, C NW SE, Sec. 9-27-2 .....S.D. 3,693 ft.
Blackwell Oil Co.'s No. 1 Harshman, Sec. 2-26-1w .....Rig on ground.

KIOWA COUNTY

Christian's No. 1 Jones, NE SE, Sec. 3-7-18w .....S.D. 820 ft.

LATIMER COUNTY

P. English's No. 1 Unknown, NW SE, Sec. 16-6-19 ....S.D. 1,542 ft.

LINCOLN COUNTY

Hilton Phillip's No. 1 Phillips, SW NW, Sec. 5-14-3 ....Drlg. 3,100 ft.
Moto et al's No. 1 School Land, NW cor., Sec. 36-17-5 ..Drlg. 630 ft.

McINTOSH COUNTY

Patterson et al's No. 1 Smith, SW cor. NW SE, Sec. 32-9-16 .....Drlg. 5,302 ft.

MURRAY COUNTY

Capitol Prod. Co.'s No. 1 Cutchall, SE NE, Sec. 6-1-2 ....S.D. 2,425 ft.

MUSKOGEE COUNTY

Sioux Oil Co.'s No. 1 Unknown, NW SE, Sec. 21-11-19 ..S.D. 1,011 ft.

OKFUSKEE COUNTY

Shepard et al's No. 1 Nevens, SE NW SW, Sec. 3-12-10..S.D. 3,638-90 ft; Wilcox sand; hole full wtr.

OKLAHOMA COUNTY

Citizens Oil Co.'s No. 1 Sage Barber, NE cor., Sec. 21-11-3w .....S.D. 1,200 ft.
L. C. Hivick's No. 1 Sunset Addition, NW SW NW, Sec. 17-11-3w .....S.D. 5,515 ft.
J. F. Cuniff, tr.'s No. 1 Church Land, NE NW SE, Sec. 17-12-4w .....Abnd. 6,700 ft.

PAWNEE COUNTY

Rookstool's No. 1 Wylie, NW NE SW, Sec. 6-20-5 .....S.D. 1,950 ft.
Cochran et al's No. 1 Green, NE cor. SW, Sec. 15-23-5..Rig.

PITTSBURG COUNTY

Tapo Oil Co.'s No. 1 Fulton, SE, Sec. 34-7-14 .....S.D. 1,200 ft.
J. Morrison's No. 1 Fowler, NE SE, Sec. 13-7-17.....Rig.
C. Kennedy's No. 1 Travis, C SW NE, Sec. 15-7-14 .....Rig.
C. Canady's No. 1 Jones, NW cor., Sec. 14-8-14 .....Rig.

ROGER MILLS COUNTY

Ute Oil Co.'s No. 1 Williams, C SW, Sec. 23-12-24w ....S.D. 5,150 ft.
L. C. Hivick's No. 1 Davis, C NW NE, Sec. 4-11-26w ....S.D. 3,275 ft.

SEQUOYAH COUNTY

Braman Oil Co.'s No. 1 Unknown, C NW SW, Sec. 29-12-22 .....Drlg. 1,137 ft.

WASHITA COUNTY

Cooper & Terhune's No. 1 Blocker, NW cor., Sec. 29-8-19w .....Drlg. 2,570 ft.; show oil 2,459-67 ft.
Burns & Prince's No. 1 Deck, SW cor., Sec. 21-9-18 ....S.D. 1,140 ft.

OKLAHOMA PANHANDLE

TEXAS COUNTY

Three Way Oil Co.'s No. 1 Crane, SW NW, Sec. 11-1-1E..S.D. 4,750 ft.

SOUTHERN OKLAHOMA

ATOKA COUNTY

Morris et al's No. 1 Mansell, SW NW NW, Sec. 9-2s-12 ..S.D. 285 ft.
Brookshire's No. 1 R. W. Rowland, NW NE SE, Sec. 18-3s-10 .....S.D. 1,530 ft.

BRYAN COUNTY

Bryan County Oil's No. 1 Childs, NW SE SW, Sec. 7-7-10..T.D. 650 ft.
Bush et al's No. 1 Commerce Trust, NE cor., Sec. 35-6s-9 .....T.D. 740 ft; plugged back to 444-80 ft.

CHOCTAW COUNTY

Hobson Bros.' No. 1 McChristian, NW NE NE, Sec. 12-6s-19 .....S.D. 730 ft.

JEFFERSON COUNTY

Smith's No. 1 McCarty, SE NW NE, Sec. 18-4s-5w .....Location.

LOVE COUNTY

Autrey et al's No. 2 Cross, CWL SE NE, Sec. 37-6s-2 ..Show oil and gas 970-72 ft. and 1,324-34 ft; S.D; T.D. 1,634 ft.

MARSHALL COUNTY

Everette et al's No. 1 Agres, SE NE, Sec. 14-7s-4 .....Drlg. 602 ft.
Summers-Sellers' No. 1 Beams, NE SW NE SW, Sec. 20-7s-5 .....Rig.
Dixson's No. 1 McDuffel, SW SE, Sec. 2-7s-6 .....Show oil 791-828 ft.; T.D. 1,096 ft.
Tallaferro et al's No. 1 fee, NW SE SE NW, Sec. 34-5s-5 .....Landing csg.; T.D. 880 ft.

McCURTAIN COUNTY

Stewart's No. 1 Patterson, C SE SE, Sec. 7-6s-24 .....S.D. 756 ft.

PUSHMATAHA COUNTY

George's No. 1 Lane, NW SE, Sec. 32-3s-15.....S.D. 840 ft.
Whitehead et al's No. 1 Messer, SE SW SW, Sec. 35-3s-13 .....S.D. 200 ft.

STEPHENS COUNTY

Brown's No. 1 Hightower, SW SE NE, Sec. 15-3s-5w ...Sand 990-1,004 ft; S.O.; S.D.

WILDCAT OPERATIONS IN KANSAS

(Continued from Page 55)

KINGMAN COUNTY

Skelly Oil Co.'s No. 1 Miles, NE cor., Sec. 30-27-10w.....1,635-40 ft. 2,000,000 ft. gas; at 2,005-20 ft., 6,000,000 ft. gas; at 2,132-42 ft., 3,000,000 ft. gas; showing oil 3,385 ft; T.D. 3,441 ft; S.D.; estimated at 600 bbls. a day.

Panhandle Drlg. Co.'s No. 1 Wetherall, C SE NW SW, Sec. 20-28-10w .....Rig.

MORTON COUNTY

Hydraulic Oil Co.'s No. 1 State Land, NW SE, Sec. 22-34-43w .....T.D. 3,640 ft; temp. abd.

MORRIS COUNTY

Allender et al's No. 1 Wycoff, C SW SE, Sec. 5-17-7.....S.D. 105 ft.
Urschel et al's No. 1 Bersuch, NW SE NW, Sec. 10-17-7..Fishing 915 ft.
Hankerson et al's No. 1 Cessman, SW SE, Sec. 24-16-9..S.D. 2,625 ft.

NORTON COUNTY

Richards et al's No. 1 Colby, Sec. 17-4-21w.....Rig.

OSAGE COUNTY

Briggs & Smith's No. 1 Wood, SE NW, Sec. 21-14-15....S.D. 2,058 ft.

RAWLINS COUNTY

J. G. Durham et al's No. 1 Weaver, SE cor., Sec. 3-2-35w..S.D. 3,925 ft.

RICE COUNTY

Cress et al's No. 1 Sharp, SE NE, Sec. 13-20-10w .....Show oil 3,107-15 ft; Siliceous 3,330-36 ft; estimated 1,500 bbls. shut in.

RUSH COUNTY

Dewey & Mitchell's No. 1 Greenawalt, C SW, Sec. 17-19-16w .....Show of oil in Conglomerate 3,325-80 ft; plugged back to 3,925-40 ft; estimated 150 bbls.; S.D.

RUSSELL COUNTY

Agate O. & G. Co.'s No. 1 Rochfellow, SE cor., Sec. 6-13-12w .....Drlg. 3,395 ft.

SALINE COUNTY

Twin Mounds Oil Co.'s No. 1 Weis, C W½ NE NW, Sec. 20-13-4w .....Drlg. 2,400 ft.

SHERIDAN COUNTY

Flo et al's No. 1 Shoemaker, SE SW, Sec. 27-7-26w ....S.D. 3,495 ft.

STAFFORD COUNTY

Rosenthal, Stanolind and Amerada's No. 1 Gray, C NE, Sec. 11-24-31w .....S.D. 3,560 ft.

STEVENS COUNTY

Argus Prod.'s No. 2 Christopher, C NE, Sec. 10-33-39w..S.D. 5,521 ft.

SUMNER COUNTY

Tighe et al's No. 1 Thieson, C NW SE SE, Sec. 22-34-2...S.D. 2,550 ft.
Trees Oil Co. and Shell's No. 1 Springate, NE SE SW, Sec. 6-34-2 .....S.D. 2,300 ft.
Spencer et al's No. 1 Porter, NE SW, Sec. 12-33-3w.....Drlg. 4,045 ft.

WASHINGTON COUNTY

Sincox et al's No. 1 Penwell, NW SE NE, Sec. 16-3-3....S.D. 1,720 ft.

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OIL BUSINESS IS IN PRIVILEGED POSITION

(Continued from Page 39)

are all human. There are probably few among us who have not done our share of erring on the side of unsound practices. Let us freely admit our shortcomings in this respect. Let us recognize that we have paid, in the long run, the penalty for our belief that we could gain advantage for ourselves by price cutting or other unsound practices. Let us recognize that the consequences of so-called price wars have been in the oil industry just what they have been in every other business where the theory of increasing sales by cutting the other fellow's price has been followed. The other fellow has invariably met the lower price; and the net result has been that the seller has lost his profits without gaining any advantage. By and large, that has been the result of such tactics in all lines of business.

It may well be asked whether it is not high time for business men to realize their responsibility for preserving the capital of which they are trustees, and to strive to make it profitable by some means other than the obviously unsound one of giving away their profits in an effort to enlarge the volume of their business. We cannot talk here about what fair prices should be. But we can all, as individuals, reflect upon what the price cutting tactics so prevalent in the industry have brought us, and upon what other competitive methods we might rely without assuring for ourselves results so damaging to our own business.

Gasoline Tax Evasion

We have become accustomed in the last few years to read in the daily press of the means by which "racketeers" have preyed upon various forms of business. We have noted that their victims were usually weak and poorly organized units of business, and we have perhaps had no thought that they might be able to direct their parasitical activities against business so well organized and able to defend itself as that of the oil industry. It has come, therefore, as a great shock to discover that gasoline tax evasion is not the petty malpractice of unscrupulous marketers that we have previously thought it, but a widespread, and in many instances, highly organized and dangerous form of "racketeering," which has already cost many millions of dollars of loss from the public revenues, which has destroyed profits of legitimate oil companies, and which threatens now to ruin the gasoline business unless most vigorous steps are taken to combat the evil.

Starting with an expose by one of the Chicago newspapers, and carried on by a committee consisting of representatives of leading marketers, an investigation in the Chicago area revealed gasoline tax evasion of startling proportions and extent. Similar investigations elsewhere have led to the conclusion that while the seriousness of the situation varies somewhat with the amount of the state tax and extent to which urban populations are involved, the evasion of the tax, either by unscrupulous marketers already well established in business or by out and out "racketeers" who have gone into the business in order to get the money which should go rightly to the public treasuries, is of nationwide and of gigantic proportions.

Eight Methods of Tax Evasion

The investigation in Illinois has revealed that there are at least eight different unfair or illegal methods by which evaders of the tax take advantage of legitimate marketers. These are the following:

1. They transport gasoline across state lines, and on being questioned as to the disposition of gasoline billed to them, produce receipts showing distribution to the adjoining state. Lack of a check-up between states makes this practice possible.

2. They set up paint factories or other industrial plants in order to show records of gasoline sold for tax-free purposes, when it is actually sold to the trade as motor fuel, and tax is collected.

3. They fail to report gasoline received, or make false reports to the state authorities as to the actual quantity received.

4. They operate under the names of dummy companies which receive and market fuel without reporting it for tax purposes. As investigation seems imminent, these companies go out of business; but the actual business is carried on continuously by transferring it to new dummies.

5. Where there is no tax on natural gasoline, naphtha, kerosene, and furnace oil, they purchase these products, blend them into a product which they sell to the public as motor fuel, and pocket the tax they collect from the public. Instances have been discovered in which such a product, colored with dye to the proper red, has been sold as high-test, antiknock fuel. This is not strictly speaking tax evasion, but it is a closely related type of fraud perpetrated upon the public.

6. They raise the gallonage figures shown on affidavits secured in connection with the tax-exempt sales, and pocket the tax on the difference between the amount actually sold to farmers and the amount reported sold in affidavits furnished to the authorities.

7. They juggle shipments and reports; for example, by diverting a shipment billed to them to some other company, usually a very evanescent concern, which is no longer in existence by the time the tax authorities begin to hunt it in checking up on the shipment.

8. They corrupt public officials by bribes or by taking them into secret partnerships, induce them to sample improperly or deliberately to falsify their reports, and secure their protection against prosecution.

Activities Do Not End Here

The activities of the evaders do not stop with collecting tax money which they do not turn into the State, nor with adulteration of products, nor with selling, as gasoline, mixtures which can by no stretch of the imagination be considered motor fuel. These same evaders, it is found, are also the operators of plants which can be operated at relatively low costs, because no attention whatever is paid to fire hazards or to state laws or city ordinances governing fire and accident prevention. They have no concern for appearances, either of plants and stations or of motor equipment. The slovenliness of their outfits and methods of operation do not reflect the high ideals and standards which the industry has always endeavored to attain. In a thousand and one ways, their disregard for law and custom and the decencies of trade can be, and is, utilized to give them monetary advantage or reward.

As taxpayers, we may deplore the loss to state and city treasuries of the millions of dollars which we now know have been going into the pockets of the gasoline tax evaders instead of into the public treasuries. As advocates of sufficient employment in this time of depression, and as advocates of more and better highways for the motor traffic of present and future, we may deplore the fact that millions of dollars which should be going into highway construction—into providing employment, if you please—are going instead into the cash boxes of "racketeers."

But we have even greater cause for complaint in the effect which tax evasion is having in undermining and demoralizing the whole system of legitimate marketing. The tax evader can cut his price by the amount of the tax, and still make as much money as the marketer who pays the tax. He can cut it by part of the tax, and make more than the legitimate marketer. He can cut it more than the amount of tax, and still make some money when the legitimate marketer is suffering a loss.

Can Cause General Price Reduction

With competitive conditions what they are, with the tendency strong on the part of all rival marketers to meet the price reductions announced by competitors, it is easy to see that a single tax evader, by cutting his prices to obtain business, can cause a reduction of prices by all other marketers in his community. If he cuts repeatedly, he can bring prices down to a level that means ruin for the legitimate marketers; while he can continue to make a profit, increasing as he obtains the business of his competitors. Low prices in one community spread rapidly to other communities. A few tax evaders here and there can wreck the price structure of a vast territory in the course of time. For a long time marketers have been meeting prices. And those who watch their accounting closely have been wondering how their competitors could make the reductions they were making. Those same competitors have doubtless been wondering, in like manner, regarding the competitors whose prices they were meeting. In many of these instances, it is now logical to conclude, on the basis of recent revelations, that the snake in the grass that has been setting these gentlemen at each other's throats was the tax evader, who had nothing to lose and everything—literally everything—to gain by forcing prices down to the point where they would eliminate his competition. The tax evader is a stone thrown in the mill pond from which waves of price reduction have spread in ever-widening circles.

It is hardly necessary to point out also that the evader brings ill repute, with the motoring public, upon the industry as a whole. When the motorist buys what he thinks is gasoline, and gets a mixture that causes a knock in his motor and fills the countryside with stench, he is likely to lose that confidence in the reliability of any product sold as gasoline which legitimate refiners and marketers have laboriously built up in the last 20 years.

What Is the Remedy?

Gentlemen, we are competitors in business; but in the gasoline tax evaders we have a common enemy. We can legally join together to battle the evaders, and we must do so. We have already seen our business demoralized by these "racketeers"; and we may see it wrecked if we do not act promptly and vigorously.

What is the remedy? As to this we have an answer from the experience already gained in the Chicago area. The first step in fighting evasion was taken there by the newspapers. They exposed the activities of the evaders, and aroused both the industry and the public to the seriousness of the situation. A volunteer committee, set up by leading oil companies in the Chicago area, took up the battle. The committee and the newspapers together were able to arouse public officials to such a degree that evasion is rapidly being wiped out in that area. Some of the evaders are in hiding, and others are facing prosecution under indictments which have been pushed through by a militant group of State's attorneys. The governor of the State has appointed a commission to investigate the State's methods of enforcing the gasoline tax laws, and is reorganizing in line with the commission's recommendations. From now on it is going to be a very dangerous thing to attempt evasion of the gasoline tax law in Illinois.

That is what is happening in one State. But the menace is nation-wide. We must deal with it on a nation-wide basis. And since the institute is the national organization of the oil industry, it is the logical organization to take up the battle of the industry against the common enemy. We have examples in what the national organization of the film industry did. Through a country-wide organization, it stopped bootlegging of films. We have an example also in what the national credit organization did, when, by operations on a national basis, it stopped millions of dollars of losses on bad credits and fraudulent bankruptcies.

Permanent Committee Needed

We must have a permanent committee of the institute to deal with evasion on a national basis. I call on every member of the institute who believes in decency and fairness and integrity in the oil business to support the organization of such a committee, and to aid it to free the industry of evaders and their racketeering methods. We must raise funds to carry on an aggressive campaign. Our committee must build a centralized intelligence organization that will discover evasion wherever a cent of gasoline tax is being evaded. It must systematically expose evaders, and aid the authorities in their prosecution. It must take all possible steps to secure uniform laws with teeth in them to make tax evasion too dangerous to be an attractive pursuit even for the reckless "racketeers" who have been invading the gasoline business. It must work with the federal government, especially to prevent interstate traffic in tax-evaded gasoline.

This national committee must have help from state and local committees, formed to deal directly and forcefully with state and local situations and conditions. These local committees can arouse legitimate marketers in their areas. They can bring pressure upon city, county, and state administrative officers to see that the gasoline tax laws and the inspection laws are vigorously enforced. They can demand action by the public prosecutors, and aid them in getting evidence that will send evaders to jail or prison. They can work with the national committee in bringing about revision of gasoline tax laws, to make them uniform and effective. They can see that the state motor fuel tax departments are kept free of dishonesty or collusion with evaders, and that they are adequately staffed by men fit to do a good and honest job of collecting the tax. They can get through arrangements for checking all shipments of gasoline against receipts reported for tax purposes. They can aid in spotting evaders' trucks, and in seeing that they are picked up by the authorities. They can bring about the padlocking of evaders' places of business. In short, these committees can be the industry's own agents in getting the laws tightened up and completely enforced.

Time for Vigorous Action

Gentlemen, the gasoline tax evaders are already too powerful to be stopped by the unaided efforts of the little band of officials whose duty it is to enforce the gasoline tax laws. Those officials are dealing with a form of enforcement which vitally affects the interests of the industry. They deserve our aid in a most active and determined way. If we do not take up the battle, all the progress we have made under the code of marketing practices will become ridiculous for its futility. If we do not act now and with determination against evasion, any high resolutions we may make as individuals to discontinue unsound price cutting tactics will be wrecked on the necessity of trying to hold our business against "racketeers" who have an advantage of 2 to 7 cents a gallon that we have not. We must join hands in one mighty effort to rid the industry, once and for all, of that unfair and illegal and disastrous form of competition provided by the gasoline "bootlegger," the gasoline tax "racketeer."

As to the gasoline taxes themselves, the institute should undertake some determination as to where the point of balance lies between the commendable aid they give to development of the highways to meet the rapidly advancing and changing needs of motor traffic and the threat they offer against expansion of consumption and development of business. Increase in the rate of these taxes has been little felt by the public, because of the downward trend of gasoline prices.

Motorists Feel Little of the Burden

The receipts from gasoline taxes have grown vast, but the motoring public has felt the burden little, because decreases in the price of gasoline have offset increases in the tax. While the tax has gone up, the oil industry has seen its profits vanish and losses take their place. The industry cannot long continue operations on the present scale of prices. There must follow an upward trend. Then will come the test as to whether gasoline taxes will become an actual deterrent to consumption and, consequently, a burden upon the industry, rather than an aid in developing facilities for use of its product.

The point of balance is doubtless different in different states. Montana may be in need for highway purposes of a higher rate of tax than Delaware. But it should be possible to establish by careful study some approximate idea in each State of the maximum beyond which the tax should not rise. And once that balance point has been determined, the institute should use its persuasion against increases of the tax beyond that point.

However low the gasoline tax rate is

held, it is a constant threat to the industry, as we have seen, in the opportunity it offers for the evader to take advantage of the legitimate marketer. And there can be no doubt that the higher the rate rises, the stronger the inducement and encouragement are for unfair advantage to be seized by practicing evasion. Thus the industry has a tremendous stake in seeing that gasoline taxes are not increased beyond levels reasonably adjusted to the needs which they properly serve.

TIME IS RIPE FOR UNITIZED PRODUCTION

(Continued from Page 38)

ber, 1926. It was not the horseback statement of a politician out to please, but the considered expression of an experienced engineer whose service on the Federal Oil Conservation Board had given him an especial familiarity with our problems. He is now President of the United States. Are we not, then, justified in hoping for a sympathetic governmental attitude?

Present Legal Conceptions

When the old principles of oil and gas recovery were enunciated by our courts, there was little technical knowledge for estimating the oil available. The industry was in its infancy, and laws and rules of that time were applied. Our present legal conceptions of ownership of underground deposits are based on a ruling made by an early Pennsylvania judge who, lacking any precedent, drew on the migratory game laws! Farmers killed ducks that flew over their lands, and were conceded ownership of such as they reduced them to possession. The judge, probably thinking that oil flowed in underground rivers—a popular early conception—and at least being fundamentally correct in adjudging oil and gas as migratory, decided that the case was analogous to that of migratory birds and animals; and, therefore, oil and gas were properly the property of the man who captured them on his land.

The early decisions were based largely on the theory that there was no other way of determining ownership. I quote briefly from a decision in 1906, in Barnard vs. Monongahela Gas Co. 216, Pennsylvania State Reports 362, which says, in part:

"There is no satisfactory way of ascertaining how much of the oil and gas that comes out of the well was in situ under this farm and how much under that. What has been held to be the law?"

Then, after stating the view that oil and gas belonged to the man who reduced them to possession through his land, the court said:

"This may not be the best rule, but neither our legislature nor our highest court has given us any better."

This seems to show conclusively that the decisions at that time assumed there was no other method of determining relative rights. I think it is agreed now by oil engineers that the only "rivers of oil" in motion under a property are those created by the extraction of the oil itself; and that the operator may receive not only the oil originally under his own property, but also that which belonged to his neighbors.

"Legalized Robbery"

Obviously, these ideas cannot be countenanced by fairminded oil men of today. Our understanding of the physics of oil and gas in underground reservoirs forces us to realize that unregulated competition results in inequities which are no less than "legalized robbery." Moreover, just as game hunters no longer have unlimited privileges, but are restricted as to numbers and seasons in which they may take game—is it not time, too, for the oil industry to get its rights defined logically? Should not the "game hog" in oil, who is destroying hundreds of millions of dollars in values be likewise controlled? We make ourselves ridiculous by retaining an archaic conception of rights, when it is possible to define them scientifically, accurately, and equitably.

Our present engineering service claims to be able to estimate within 3 per cent the amount of oil recoverable from a given proved area. So, if the recovery is given an equitable distribution among surface owners, and if we are permitted a reasonable measure of co-operation, it will be possible for us not only to increase the total recovery, but to produce it more cheaply, and with less capital investment. We can insure long years of prosperity to the communities in which we operate, as contrasted to the mushroom developments so familiar to us: booms, that leave in their wake deserted towns, wrecked banks, and impoverished merchants. We will be able to furnish steady employment, to build up a reserve of raw material, and to insure a stable and continuing tax income in the communities where we operate—commensurate with the values produced.

Government Accepts Estimates

The government, in its depletion allowances, accepts the engineering estimates of recovery. The old theory of discovery rights was doubtless the best possible when it was enunciated; but if these rights can be determined with substantial accuracy, there is no more reason why one operator should steal oil or gas from beneath his neighbor's land than that he should take coal, iron, or any other property.

The oil industry under the old program of "getting thar fustest with the mostest" wells has built up a great business; but in doing so it has created a Frankenstein which bids fair to ruin its creator and destroy a most important national resource. Wallace E. Pratt, a recognized authority, recently estimated 10,000,000,000 bbls. of oil in sight, and said we are now using 900,000,000 bbls. a year. He says it will take 30 years to produce this 10,000,000,000 bbls., and that during each year of this period we will have to develop 1,000,000,000 bbls. of new discoveries, equal to 10 major fields; also, on the experience of the past 14 years we will require to explore 3,000,000 acres per year by drilling 20,000 wells. Most of the 3,000,000 acres thus explored will be eliminated from future consideration, as the production will come from about 2 per cent of the area explored.

If Mr. Pratt is right, the industry under our present procedure will drill in the next 20 years 400,000 wells at an average cost of $50,000; total, $20,000,000,000. On the other hand, scientific and noncompetitive drilling would produce the same amount from one-half—or less than one-half—as many wells, at one-half the expense; and when we had done that, we would still have the recoverable oil left in the sands, because of better engineering practices under such a plan. In fine, unit development and equitable distribution promise to double our recoveries from a given field, at half the cost of drilling.

Dare Not Reject Program

Can we reject such a program? I say we do not dare. It seems to me that if the industry shall merit confidence in either its financial operations or in its atittude toward conservation, it must forthwith solve this, its greatest problem. To fail will be to admit that our industry can only be managed under martial law.

President Hoover's statement, from which I have quoted, assures us of governmental co-operation. Unquestionably, the overwhelming majority of the industry agrees with him. Let me quote briefly from some men whose qualifications to speak will hardly be questioned. On September 21, R. C. Holmes, president of The Texas Company, wrote me:

"I am definitely of the opinion that it probably is perfectly sound busisess and ethical for a man to have the right to do with his property as he sees fit in most cases, but that when action on his part (as applies to the production of crude petroleum) forces an action on his neighbor, regardless of market conditions or prices, it is in principle unsound and can be very unfair."

And Henry M. Dawes, president of the Pure Oil Co., on September 19, wrote me:

"The law of the jungle is that 'finders are keepers.' With the exception of the migratory products of oil and gas, this principle is not supported by statute. Production of oil and gas in the past has been largely governed by the effort of producers to run their drills down so fast that they will get not only their own oil, but that which really belongs to their neighbors. This is the practice which is responsible for 90 per cent of the havoc occasioned by irrational, unregulated production. The proper recognition of property rights is possible through the co-operative operation of oil pools as units. If the predatory instinct of human nature should ever be mitigated by appeal to enlightened self interest, it is perfectly possible, legally and physically, to evolve a system of civilized operation."

Unprofitable Methods

From D. J. Moran, president of the Continental Oil Co., I quote this vigorous pronouncement:

"I am definitely of the opinion that each separate owner is entitled to a share of the oil and gas produced from an area on a per-acre basis of ownership. The present cut-throat methods of extracting oil as fast as it is possible to secure it have proven to be very unprofitable."

Also, W. H. Berg, vice president of the Standard Oil Co. of California, wrote me on September 30, as follows:

"The most logical solution of the problems of overproduction of crude oil is the unit plan for the development of pools, under which each separate owner would receive his proportionate share of the oil and gas in a pool, as opposed to the present scramble in which each owner seeks to capture as much as fast as he can."

The number of such expressions might be expanded indefinitely; but it is unnecessary. Profoundly convinced that they represent the best and the preponderant judgment of the industry. I urge that, by unanimous vote, the institute agree to the two principles I have presented. Let me restate them:

1. That unit operation, which we have heretofore approved, should be practiced in all new developments, and introduced as fast as possible in old ones; and that we set up machinery to bring about the removal of any obstacle to this program, through state legislation.

2. That the owner of the surface is entitled only to his ratable share of the oil and gas in a common pool, and we will unite to seek to bring about acceptance of this principle in the laws of the oil-producing states.

Trustees For a Vital Resource

I am convinced, gentlemen, that we are going to have legislation, whether we will or not. Those who want better methods of producing oil should be permitted to use them; others should be compelled. The signs of the times make it plain that delay on our part will not be tolerated. An industry that has seen half its production under martial law, and all of it under the accusation of incompetence and profligacy, may well take stock of its future. It is no longer of any use to inveigh against governmental interference with business, or to denounce as revolutionists any who disagree with us. The country, the world, looks upon us as trustees for a vital resource. Our administration of that trust has not been satisfactory. If we are to retain our trusteeship, if we are to keep our hold on this industry, we must win back a public confidence that we have lost.

EASTERN FIELDS

(Continued from Page 67)

very tight and shows a high rock pressure. The Herwig test is 100 feet lower on the ridge. Tentative plans have been made for piping the town of Somerset for gas from that pool, a local company holding the franchise and at present making plans for a distributing system. The company has figured that the supply is ample at the present time and with continued drilling in that vicinity more than sufficient reserves can be set up.

SOUTHEAST OHIO

Eight completions were reported from southeast Ohio, and these included two gas wells which were fair tests, and six oil wells with an initial production of 63 bbls. The largest producer was in the shallow drilling in Medina County, and was the test of F. Barnhard and others on the J. W. Funk farm, Lot 6, in the northeast quarter of Harrisville Township. It was completed at a depth of 434 feet and after shot produced 40 bbls. the first day. In the same county but in Chatham Township, E. R. Edson & Son Co. completed two more producers. On Lot 7, Section 13, their No. 20 on the Daniel Ross was completed at 390 feet and made 4 bbls. the first day after shot. On Lot 4, Section 13, their No. 24 on the productive George W. Packard No. 1 lease made 4 bbls. also the first day after shot and from a depth of 421 feet.

In Monroe County, further production was found in the test of Gordon Green and others on the W. W. Draper farm, Section 11, Franklin Township. This well was drilled in the Injun sand at a depth of 1,330 feet. It produced 10 bbls. the first day natural. In Noble County, and in the well defined limits of the Chaseville Pool, C. W. Rich and others drilled a second test on the J. K. and William Laughlin farm in the SE, Section 18, Seneca Township. It was completed in the Berea grit at 1,496 feet and produced 1 bbl. natural the first day which was increased to 3 bbls. a day after shot. In Vinton County, the Powers Oil & Gas Co. completed No. 7 on the Cameron S. Clark farm, near Bollins Mills, Section 4, Knox Township. It is a grit sand well at 1,090 feet, making about 2 bbls. a day after shot.

Gas Wells

Muskingum County had two fair gas wells as the result of tests. In the NE. Section 11, Washington Township, the Ohio Fuel Gas Co. drilled a test on the H. A. Mangold farm in the Clinton sand to a depth of 3,938 feet. It is showing good for 1,000,000 feet a day. In Falls Township of this county, the same company drilled a test on the John Seibaugh farm, also in the Clinton sand, down 3,762 feet. It is rated good for 5,000,000 feet a day.

Drilling in Ohio

In Meigs County, James Simpson and others are drilling on the Thomas Jackson farm in Sutton Township. In Washington County, Homer Newhart and others have a second test drilling on the Maggie Lisk farm, Section 3, Ludlow Township. In Noble County, the Permain Oil & Gas Co. has a test drilling on the C. I. McKee farm, Section 13, Olive Township, and past the 1,200-foot level.

WEST VIRGINIA

New oil production is very scarce in West Virginia and there was but one new oil well reported. It is the test of W. C. Wilson and others on the A. B. Hersman farm in the Henry district, Clay County, which was completed in the Injun sand and is showing for a 5-bbl. a day pumper. Drilling in this county, and in the limits of the pool there, has been discontinued since the low prices of crude. Since the lifting of the proration ban, there has been considerable cleaning out and shooting of old producers. The Virginian Gasoline & Oil Co. shot its No. 13 on the J. B. Castro farm and raised its production from 4 to 8 bbls. a day. The South Penn Oil Co. did the same with its No. 51 O. D. Stockley, and raised the production from 11 to 25 bbls. a day. In DeKalb district, Gilmer County, the same company cleaned out No. 6 C. W. Goff and increased production from 5 to 8 bbls., and in the same district the Hope Construction & Refining Co. shot and cleaned out its test on the R. L. Weaver farm raising the production from 3 to 7 bbls.

Gas Wells

In Cabell County there were two completions. On the waters of Dry Fork, Grant district, the Monickel Gas Co. completed No. 30 E. S. Jacks in the Brown shale and has a fair gas well. On the banks of Mud River, in Grant district, the General Gas Co. completed its second test on the William Chambers farm, also in the Brown shale, and it is rated good for 250,000 feet a day. This well is about 2,200 feet south of the test on this farm.

The activity in Calhoun County continued and four wells were completed. In Lee district, the Evans Oil & Gas Co. drilled a second test on the John Evans farm in the Injun sand and has a fair gas well. In the same district, the Crummies Creek Fuel Corp. completed No. 3 on the Oliver Brannon farm at a depth of 1,747 feet and in the Injun sand. It is also a

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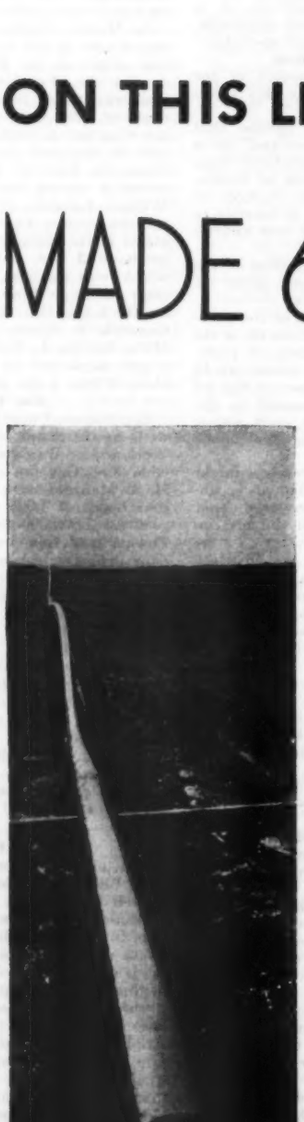

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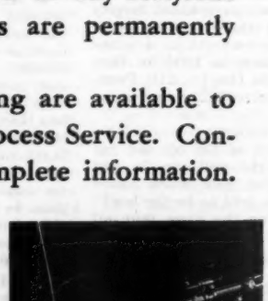

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gas well. On the waters of Annamoriah Creek, Sheridan district, Thomas Crowley drilled a third well on the William Cooper farm in the Berea sand and completed it for a gas well. In Center district, Bickerstaff and others completed a test on the W. A. Stallman farm at 2,323 feet and in the Berea sand. It is showing for a small gasser.

In Marion County, the Owens Illinois Glass Co. drilled its No. 145 Z. E. Michael farm in Paw Paw district to a depth of 3,044 feet. It will make a small gas well. In Roane County, J. P. Young and others drilled a test on the Holly Walker farm in Spencer district to the Berea sand and it is showing for a small gasser. The only dry hole was the Winifrede Co.'s No. 15 on its Wrightsville lease in Cabin Creek district, Kanawha County.

The recapitulation for the week's work in West Virginia shows one oil producer, 5 bbls. initial, eight gas wells and one dry hole.

Drilling in West Virginia

In Roane County the following work is noted: In Curtis district, the deep test of the United Fuel Gas Co. on the J. W. Hinzman farm is past the 8,000-foot level, the last report being 8,040 feet. In the same section the Reedy Oil & Gas Co. has a second test on the A. J. Paugh farm down to 1,625 feet, and W. H. Heeter is rigging up for a second well on the Robert Knopp farm. In Smithfield district, the Ohio Valley Gas Co. is down 1,450 feet on the D. M. Ferrell heirs farm. In Spencer district, J. P. Young and others have a rig standing on the Dan Connelly farm. George Smith and others are rigging up on the C. A. Kendall farm, same district. In Reedy district, the Heck Oil Co. has the material on the ground for a fifth well on the H. W. Allen farm.

Work in Calhoun County continues active. In Lee district, F. F. McIntosh has two wells drilling. No. 3 on the J. Duskey farm is down to 1,765 feet, and No. 4 on the John Riddle farm is drilling at 550 feet. This operator has the material on the ground for No. 3 on the Fox and Morgan lease, and has made a location on the Carr Shaffer farm. L. L. Townsend and others are drilling in this district on the Sylvester Brannon farm and the test is down 1,840 feet. In the same section, Ed Hess and others are down 2,110 feet in a second well on the John Evans farm. In Sherman district, Creed Barker and others have their test on the Glory Hathaway farm drilling at 1,775 feet. In Center district, W. H. Bickel is down 600 feet in No. 5 on the J. M. Bennett heirs farm. This operator has a rig standing for a second test on the George D. Starkey farm. In Sheridan district, Roy Waggoner and others have reached 1,900 feet on the Clay Chenowith farm. On the Gay Wilson farm, Creed Barker and others are drilling at 1,920 feet. In the same section, T. J. Crawley is drilling No. 4 on the William Cooper farm and has reached 1,875 feet. The Chemical Oil Co. is at 1,900 feet in its No. 5 on the A. T. Yoke farm.

In this district, the Conservation Oil & Gas Co. has a rig standing for a second test on the James Kerby farm. In Washington district, the Eastern State Gas Co. is drilling a second well on the Lubana J. Jarvis farm and has reached 620 feet. In Sherdian district, the United Fuel Gas Co. is down 1,661 feet in No. 4,319 on the Ida Shroyer farm, and W. W. Dailey and others are drilling at 1,690 feet on the Rome Bowers farm.

Among the new operations, the Woodyal Gas Co. has made a location on the Charles Honaker farm in Union district, Lincoln County, and Pridemore and Adkins are rigging up for a second test on the M. Miller and R. Topper lease in Jefferson district. In Trap Hill district, Raleigh County, Godfrey L. Cabot is drilling his No. 3 on the Beaver Coal Co. lease at below the 2,500-foot level.

SOUTHWEST PENNSYLVANIA

There was but one well completed in southwest Pennsylvania. It was J. L. Garard & Co.'s No. 38 on the J. L. Garard No. 2 farm in Greene Township, Greene County. It was completed at 650 feet and in the Dunkard sand and is estimated good for a 4-bbl. pumper.

The H. D. Freeland & Co. test on the D. T. Freeland farm is due in soon, having reached 3,010 feet. This is in Wayne Township, Greene County. In Perry Township, the Philadelphia Oil Co. has started drilling a test on the A. B. Wade farm and is down about 200 feet.

JOHN L. KIRKLAND DEAD

WHEELING, W. Va.,—Nov. 6.—John L. Kirkland, age 74, for years general superintendent of the South Penn Oil Co. in the West Virginia district and later an oil producer in Oklahoma and Texas, died here last night. Mr. Kirkland had lived in Wheeling for the past 24 years. Mrs. Kirkland survives, together with a son, Albert E. Kirkland, an oil operator in Tulsa, Okla., and several daughters.

LOUISIANA-ARKANSAS PROVEN AREAS

(Continued from Page 58)

Roy Baker's No. 1 Sabine Lbr. Co., Sec. 1-7-12 ..... W.O.S.R. 2,548 ft.
W. M. Coates' No. 1 Bowman-Hicks, 330 ft. S and W. of C, Sec. 3-7-12 ..... W.O.S.R. 2,441 ft.
Dengall O. & G. Co.'s No. 3 Nulton, 330 ft. N and E, SW cor. NW NE, Sec. 1-7-13 ..... Drlg. 1,450 ft.
O. A. Gautier et al's No. 1 Mischell, 330 ft. E, 150 ft. N, SW cor. SE NW, Sec. 30-8-12 ..... S.D; W.O. 2,532 ft.
Hawkins & Antoon's No. 1 Newton, Sec. 1-7-11 ..... W.O.S.R. 2,609 ft.
Hudson & Bird's No. 1 Walden, 480 ft. N, 300 ft. E, SW cor. SW NE, Sec. 26-8-11 ..... S.D. 1,800 ft.
M. J. Kissick's No. 1 Brown Lbr. Co., Sec. 1-7-11, 1,070 ft. S, 1,225 ft. E, NW cor. NE ..... S.D. for fuel 600 ft.
Zeke Lohman's No. 1 McCormick, 660 ft. E, 330 ft. N, SW cor. NE SW, Sec. 2-7-11 ..... S.D. 1,606 ft.
Loring Oil Co.'s No. 18 Bowman-Hicks, 1,320 ft. S, 275 ft. E, NW cor. SW NW, Sec. 15-7-12 ..... Drlg. lime and shale 4,079 ft.
Lyons & Neely's No. 3 Byrd, Sec. 1-7-11 ..... S.D. 400 ft.
L. K. McGuffin's No. 1 Bush, NW cor. NW SE, Sec. 1-7-11 ..... S.D. 400 ft.
Ben Merritt, tr.'s No. 2 Byrd, Sec. 1-7-11 ..... S.D. 88 ft.
Ohio Oil Co.'s No. 12 Bowman-Hicks, Sec. 2-7-12, 150 ft. N and W, SE cor. NE NE ..... Set 6⅝-in. csg. 2,208 ft.
H. W. Perritt's No. 6 Bowman-Hicks, Sec. 2-7-12, 150 ft. S and W, NE cor. SE NE ..... Rigging up.
Eddie Self's No. 2 Jacob, Sec. 1-7-11 ..... Drlg. 1,910 ft.
Stovall, tr.'s No. 2 Nulton, 241 ft. N, 330 ft. W, SE cor. NE NW, Sec. 1-7-13 ..... Drlg. 2,190 ft.

UNION PARISH

Interstate Nat. Gas Co.'s No. 27-C Howard, 660 ft. S and E, from C, Sec. 32-20-3e ..... Drlg. 2,050 ft.
Nemours Corp.'s No. 1-C Harrell, Sec. 7-20-4e, 1,980 ft. S and E, of NW cor. ..... Drlg. 2,080 ft.

Stovall Gas Co.'s No. 2 Howard, Sec. 32-20-3e, 1,320 ft. S, 1,980 ft. W, NE cor. ..... Drlg. 1,470 ft.

ARKANSAS

UNION COUNTY—EL DORADO

Lion O. & R. Co.'s No. 9-A G. P. Hayes, 242 ft. S, 246 ft. W, NE cor. Lot 5, NE, Sec. 4-16-15 ..... Cored rock salt 6,071-85 ft.
Southern Prod. Co.'s No. 1 Wingfield, NE cor. SE NW, Sec. 16-19-15 ..... S.D. 2,608 ft.

UNION COUNTY—URBANA

Marine Oil Co.'s No. 1 Winn est., 330 ft. S and E, NE cor. 8⅛ NW, Sec. 11-18-13 ..... T.A. 3,536 ft.
Marine Oil Co.'s No. 2-E Thompson, 330 ft. N, 330 ft. E, SW cor. NE NE, Sec. 10-18-13 ..... Location.
Wilson & Chapman's No. 1-B Hadley, Sec. 3-18-13, 330 ft. S and W, NE cor. SE NW ..... Drlg. shale 2,600 ft.

EAST TEXAS

PANOLA COUNTY

Daisy O. & G. Co.'s No. 1 Rucks, Jno. Palmer Sur. ..... S.D. 3,270 ft.
Dillon & Braham's (was W. G. Banks et al's) No. 1 C. O. Baldwin, 1,395 ft. W, 1,362 ft. S, NE cor. Baldwin 290 ac. in Hampton West Sur. ..... S.D. 1,555 ft.
Nat. Gas Prod. Co.'s No. 8 Floyd, 50 ft. S and 100 ft. W from No. 1 Floyd, Ben C. Jordan Sur. ..... Rigging up.
United Prod. Corp.'s No. 17 Steele, 1,320 ft. N, 660 ft. W, SE cor. C. D. Steele lse., in B. C. Jordan Sur. .. Location.

MISSISSIPPI

HINDS COUNTY

Ferguson-Fuller et al's No. 1 Sours et al, Sec. 34-6n-1e, 665 ft. E, 50 ft. S, NW cor. SW ..... Set 15½-in. 42 ft.; drlg. 600 ft.
Howie & Howie's No. 1 fee, Sec. 34-6-1e, 400 ft. E, 570 ft. S, NW cor. SW SW ..... Derrick.
Millsaps College's No. 1 fee, Sec. 34-6n-1e, 2,225 ft. N, 1,412 ft. W, SE cor. Sec. ..... Location.

RANKIN COUNTY

Cummins & Montgomery's No. 1 Ivey, Sec. 13-5n-1e, NE Lot 10, Blk. D, E. Jackson Pl., first addn. .... Derrick pattern.
J. E. Grandstaff et al's No. 1 East, Sec. 12-5n-1e, 1,180 ft. W and 515 ft. N, SE SW ..... S.D. for csg. 2,356 ft.
McGuire et al's No. 1 Motor, Sec. 12-5n-1e, 1,763 ft. N, 1,800 ft. W, SE cor. ..... Set 10in, 86 ft.; drlg. 275 ft.
Muse & Muse's No. 1 Seany, Sec. 12-5n-1e, 2,670 ft. E, 375 ft. S, NW cor. SW ..... Rigging up.
Muse & Muse's No. 1 Wright, Sec. 12-5n-1e, 169 ft. W, 1,163 ft. N, SE cor. SW ..... Set 10-in., 91 ft.; drlg. 105 ft.
Orr's No. 1 Casey, Sec. 12-5n-1e, 540 ft. E and 1,920 ft. S, NW cor. SW ..... Comp. 35,000,000 ft. gas 2,378 ft.

WILDCAT OPERATIONS IN MISSISSIPPI

CLARKE COUNTY

Company, farm and location—	Remarks:
Gulf Ref. Co.'s No. 1-A Long Bell Lbr. Co., C SW SW, Sec. 10-2n-16w	Tested 30 ft. oil and 50 ft. S.W. 3,700 ft.

HINDS COUNTY

Atkins et al's No. 1 Crane Lawrence, Sec. 23-6n-1e, 300 ft. E, 132 ft. N, SW cor. NE SE ..... Location.
Howard Oil Co.'s No. 1 Jackson College, C NW NW, Sec. 9-5-1e ..... S.D. 74 ft.
Southern Pet. Co.'s No. 1 Wilson (was Tri-State O. & G. Co.'s), 320 ft. E, 240 ft. N, SW cor. SE NE, Sec. 28-6-1e ..... S.D. 20 ft; W.O.
F. E. Stewart et al's No. 1 Miss. Cotton Seed Products Co., Sec. 4-5n-1e, 320 ft. S and 440 ft. W of NE cor. SE ..... Derrick.

HUMPHREYS COUNTY

Danciger O. & G. Co.'s No. 1 Belgrade Lbr. Co., C NW, Sec. 29-14n-4w ..... Drlg. shale 2,650 ft.

JASPER COUNTY

Bay Springs Pet. Co.'s No. 1 Keyes, C NW NE, Sec. 2-13-9 ..... S.D. 2,360 ft.

LOWNDES COUNTY

Lowndes County Oil & Dev. Co.'s No. 1 Carr est., Sec. 34-17-16e, 1,320 ft. E, 330 ft. S, NW cor. Sec. ..... Derrick.

MONROE COUNTY

Amory Dev. Co.'s No. 1 Bourland, Sec. 2-13-19 ..... S.D. 3,015 ft.
McAlpine et al's No. 1 Cowart, second hole, Sec. 2-12-19.. Drlg. sandy lime 3,740 ft.

NEWTON COUNTY

Bob Dalton's No. 1 Majure, 400 ft. N, 300 ft. E of SW cor. SE, Sec. 25-6n-11e ..... S.D. 847 ft.

NOXUBEE COUNTY

Thompson & Donohue's No. 1 Donohue, Sec. 25-16n-17e.. Tested dry 1,735 ft.

RANKIN COUNTY

Attkisson & Dyer's No. 1 Valentour, 200 ft. S, 200 ft. E, NW cor., Sec. 18-5n-2e ..... S.D. 1,422 ft.
Gulf Ref. Co.'s No. 1-A Hanna, Sec. 23-6n-1e ..... Drlg. chalk 2,920 ft.
Majestic O. & G. Co.'s No. 1 Elton Lbr. Co., Sec. 10-4n-3e. Derrick.
Square Deal O. & G. Co.'s No. 1 Spann, NW cor. SE NE, Sec. 13-5n-1e ..... Set 4½-in. 2,495 ft.
United Gas Public Service Co.'s No. 1-A McLaurin, 3,950 ft. E, 660 ft. S, NW cor. SW, Sec. 8-5n-2e ..... Drlg. hard sandy lime 3,000 ft.

SCOTT COUNTY

M. U. Culley et al's No. 1 Owens, Sec. 2-8-9 ..... Derrick.

WARREN COUNTY

Eagle Bend O. & G. Co.'s No. 1 Kiger, SW cor. SW SE, Sec. 9-18-3 ..... S.D. 2,607 ft.
United Gas Public Service Co.'s No. 1 Tchula Co-Operative Store, 1,980 ft. W, 660 ft. N, SE cor. SE, Sec. 33-15n-3e ..... Drlg. 3,091 ft.

WEBSTER COUNTY

P. J. McAlpine's No. 1 Henly (was Cumberland Oil Co.'s No. 1 Henly), SE NW, Sec. 15-21n-11e ..... S.D. 1,800 ft.

WINSTON COUNTY

Miss. Drlg. Co.'s No. 1 Scarbrough, NW cor., Sec. 15-12-14 ..... S.D. 4,080 ft.; repairing boiler.

WILDCAT OPERATIONS IN LOUISIANA-ARKANSAS

(Continued from Page 58)

R. A. Keaton's No. 1 Stephens, Sec. 25-16-6, 320 ft. N and W, SE cor. NW NW ..... Derrick.
Mid-West Prod. Co., Inc.'s No. 1 H. Brown, Sec. 34-11-10, 200 ft. W, 330 ft. S, NE cor. SE ..... Rigging up.
C. M. Talley et al's No. 1 C. M. Talley, 1,980 ft. W, 660 ft. S, NE cor. SE, Sec. 29-11-10 ..... S.D. 1,380 ft.

OUACHITA PARISH

Wilson & Mitchell's No. 1 Williams, Sec. 5-16-1e, 330 ft. E, 240 ft. S, NW cor. SW SE ..... Derrick.

RED RIVER PARISH

La. Oil Dev. Co.'s No. 2 La. Delta Pecan Co., 2,950 ft. S, 300 ft. E, NW cor., Sec. 27-13-11 ..... Spudded in; S.D. 50 ft.
Mack Jourden Co.'s No. 1 Lockett, 4,035 ft. S, 1,050 ft. E, NW cor. SW, Sec. 29, in Sec. 32-13-10 ..... S.D. 2,550 ft.

RICHLAND PARISH

Alto Gas Co.'s No. 2 Hunt, 660 ft. S and E, NW cor., Sec. 13-17-5 ..... Derrick.
National Gas Co.'s No. 1 Singletary, 1,980 ft. N, 660 ft. W, SE cor., Sec. 20-13n-7e ..... S.D. 2,515 ft.
Southern Carbon Co.'s No. 1-B C. M. Noble, 2,966 ft. N, 1,525 ft. W, cor. Secs. 7, 8, 17 and 18, in Sec. 37-15-6.. Location.

SABINE PARISH

W. M. Coate's No. 1 Stille, 330 ft. N, 660 ft. W, SE cor., Sec. 35-8-12 ..... Derrick.
Davidson & Grigsby's No. 1 Martinez, Sec. 2-7-13, 330 ft. S and W, NE cor. NW SE ..... Derrick.
Diffie & Barnett's No. 1 Lites (was J. W. Clark's), 330 ft. N, 330 ft. W, SE cor. SW NW, Sec. 34-8-11..... S.D. 105 ft.
Exchange Pet. Co.'s No. 1-B Louisiana Long Leaf Lbr. Co., Sec. 35-8-11, 300 ft. N and E. of W cor. NE NW. Derrick.
R. L. Gay, tr.'s No. 1-A Long Bell Lbr. Co., 430 ft. S, 200 ft. W, NE cor. NW NW, Sec. 10-8-13 ..... S.D. for wtr. 3,753 ft.

Gehrig Oil Co.'s No. 1 Skinner, Sec. 16-8-11, 615 ft. E, 565 ft. S, NW cor. NW ..... S.D. for water 104 ft.
W. M. Coates' No. 1-A Bowman-Hicks, 330 ft. S and E, NW cor. SW SW, Sec. 18-7-12 ..... Drlg. 2,500 ft.
T. M. LeGrand's No. 1 Peterson, 330 ft. N and E of C, Sec. 34-7-13 ..... Arranging to set 6-in. 2,243 ft.
J. J. Keen, tr.'s No. 1 Belton (no check), Sec. 31-9-13 .. S.D. 2,039 ft.
A. H. Thames' No. 1 Edward est., 150 ft. NW SE cor. NE SE, Sec. 8-8-13 ..... S.D. 1,200 ft.

TENSAS PARISH

U. A. Duvall et al's No. 1 Martin Jacob, 150 ft. S, 150 ft. W, NE cor., Sec. 1-14-11e ..... S.D. 3,060 ft.
A. R. Willis et al's No. 1 Currey, 1,320 ft. S, 1,320 ft. E, NW cor., Sec. 39-11-12 ..... S.D. 3,545 ft.

ARKANSAS

CHICOT COUNTY

R. R. Smith's No. 1 Lytle, 660 ft. N, 660 ft. E, C, Sec. 21-23-3 ..... T.A. 2,975 ft.

COLUMBIA COUNTY

Kendall Oil Co.'s No. 1 Fullenweider, Rhea & Kitchen, Sec. 13-17-22 ..... S.D.; W.O. 814 ft.

CLAY COUNTY

S. C. Jeffus' No. 1 Underwood, 510 ft. N, 350 ft. W, C, NW SE, Sec. 4-20-3 ..... S.D. 1,280 ft.

CLEVELAND COUNTY

Crum & Stillwell's No. 1 E. R. Bell, Sec. 10-10s-12w .... Rigged up and S.D.

CLEBURNE COUNTY

(Cable tools)

Donnelly-Craver et al's No. 1 Donophan Lbr. Co., SE cor. NW, Sec. 33-11-9 ..... S.D. 3,740 ft.

CRAWFORD COUNTY

Ozark Nat. Gas Co.'s No. 1 Hammond, C SE SE, Sec. 29-10-29 ..... Reaming 1,675 ft.

DALLAS COUNTY

E. C. Brewer's No. 1 W. E. Hillman, 330 ft. E, 40 ft. S, NW cor. SE NE, Sec. 20-10-13 ..... S.D; W.O. 2,869 ft.
J. H. James, tr.'s No. 1 Fordyce Lbr. Co., 200 ft. S. 200 ft. E, NW cor. NE, Sec. 11-9-15 ..... S.D. funds 2,520 ft.
Zepp O. & G. Co.'s No. 3 Hillman, Sec. 20-10-13, 180 ft. N, 450 ft. E, SW cor. NW NE ..... Location.
Zepp O. & G. Co.'s No. 2 Hillman, 450 ft. E, 340 ft. S, NW cor. SE NE ..... Dry and abnd. 2,688 ft.

HOT SPRINGS COUNTY

Star Oil Co.'s No. 1 Cunningham, 285 ft. S, 285 ft. W, NE cor., Sec. 11-5-16 ..... S.D. 1,300 ft.

LINCOLN COUNTY

Lawrence Cook, tr.'s No. 1 McGhee Planting Co., 420 ft. S, 200 ft. W, NE cor. NE SW, Sec. 5-8-7 ..... S.D. 2,800 ft.

LITTLE RIVER COUNTY

Roberts Oil Co.'s No. 1 H. J. Russell, 330 ft. E, 330 ft. S, NW cor., Sec. 25-12-19 ..... Location.
Stephens et al's No. 1 Dierke Lbr. Co., Sec. 29-13s-31w, 150 ft. S, 330 ft. E, NW cor. NE NW ..... Rigging up.

LOGAN COUNTY

J. H. Flowers' No. 1 J. H. White, Sec. 13-6-26 ..... S.D.; W.O. 3,570 ft.

MILLER COUNTY

W. E. Noel et al's No. 1 Dickson hrs., 1,980 ft. W, 660 ft. S, NE cor., Sec. 11-20-27 ..... S.D. 1,955 ft.

OUACHITA COUNTY

Bolin & McLeon's No. 1 L. D. Nealy, 150 ft. S, 150 ft. W, NE cor. SE SW, Sec. 25-16-15 ..... Comp. 50 bbls. 2,112 ft.

Copenhaven et al's No. 2 Berg, C SE SE, Sec. 13-15-17 .. S.D. for funds 532 ft.
M. S. M. Oil Co.'s No. 4 Arnold & Doyle, Sec. 23-16-15, 200 ft. S and E, NW cor. SW SE ..... Drlg. 1,850 ft.

PIKE COUNTY

E. R. Henderson's No. 1 Tilyou, 660 ft. W, 500 ft. S, NE cor. NE SE, Sec. 26-8-24 ..... T.A. 2,909 ft.
E. R. Henderson's No. 1 J. L. Lee, 400 ft. S, 350 ft. E, NW cor. SW SE, Sec. 21-8-24 ..... S.D; W.O. 1,020 ft.
E. R. Henderson's No. 1 W. B. East, 200 ft. S, 150 ft. W, NE cor., Sec. 13-9-23 ..... S.D. 338 ft.

PRAIRIE COUNTY

Powell Creek O. & G. Co.'s No. 1 Kloss, NE SW, Sec. 3-4n-6w ..... Partly rigged up and S.D.

SCOTT COUNTY

Heavener O. & G. Co.'s No. 1 Riser, Sec. 36-4-26 ..... S.D; T.D. 1,436 ft.
Waldron O. & G. Co.'s No. 1 White, NE cor. SW NW, Sec. 17-3n-29 ..... S.D; waiting on csg. 1,860 ft.

SEVIER COUNTY

Tristate Oil Co.'s No. 1 McCown, Sec. 34-3-32, S½ SW... Partly rigged up and S.D.

UNION COUNTY

Drillers Oil & Dev. Co.'s No. 1 Pickering, 220 ft. N, 668 ft. E, SW cor. NW NE, Sec. 1-17-16 ..... Coring and testing 2,134 ft.
H. H. Helms' No. 1 C. H. Murphy, NE cor. NW NE, Sec. 31-16-14 ..... Rigging up.
Joe Modisette et al's No. 1 W. D. Webb, Sec. 6-15-13, NE cor. NW SE ..... Tested small show gas 2,532 ft.
Sunby et al's No. 2 Perdue, Sec. 33-16-14, 75 ft. S, 150 ft. E, NW cor. Sec. ..... W.O. 3,247 ft.

WASHINGTON COUNTY

(Cable tools)

C. H. Willoughby's No. 1 Jones, Sec. 34-16-30 ..... S.D. for funds 1,795 ft.

YELL COUNTY

(Cable tools)

Tegmeir & Luckett's No. 1 Falcon, Sec. 36-7-21 ..... S.D. 5,710 ft.

EAST TEXAS

BOWIE COUNTY

Hindeman & Bell's No. 1 Merritt (was Maud-Redwater Oil Co.'s), 175 ft. N, 175 ft. E, SE cor. G. W. Hardidge 100-ac. tr. on Floyd Merritt tr. in Y. S. McKinney Sur. ..... S.D. 3,310 ft.
Logan & Elliott's No. 1 Smith, 2,600 ft. S, 2,500 ft. W, NE cor. Chas. Lewis Sur. ..... S.D. 4,505 ft.
Tarkington & Jones' No. 1 W. W. Whybark, 200 ft. S, 200 ft. W, SW cor. J. H. Dyer Sur. ..... Reaming 1,510 ft.
Lee Timberlake et al's No. 2 Tidwell, 2,510 ft. N, 655 ft. W, SE cor. T. M. Rice Sur. ..... S.D. 3,000 ft.

CAMP COUNTY

McDonald Bros.' No. 1 Tillery, 150 ft. E, 450 ft. S, NW cor. 127-ac. tr. in J. H. Murphy Sur. ..... S.D. 3,600 ft.

CASS COUNTY

J. F. Morrisey's No. 1 T. J. Wilson, 1,085 ft. S of N line, 3,376 ft. E of W line of H.R.S., J. R. McFarland Sur. ..... S.D. 3,670 ft.
Davis & Pigg's No. 1 Roy Brian, SW cor. Roy Bryan 88-ac. tr., Albert H. Latimer Sur. ..... S.D. 2,055 ft.
Everets Drlg. Co.'s No. 1 H. W. Whittington, 200 ft. S and W, NE cor. 69-ac. Whittington tr., L. Strong Sur. ..... S.D. 3,922 ft.
Geo. McKamie's No. 1 R. E. Hall, 150 ft. N, 150 ft. W, SE cor. Hall's 117-ac. tr., H. Buckler Sur. ..... S.D. 4,195 ft.
C. E. Murdock's No. 1 First National Bank, Evans Watson Sur. ..... S.D. 4,390 ft.
John C. Rogers' No. 1 I. E. Lanier, 573 ft. N, 879 ft. W, SE cor. Lanier 86 ac. in K. E. Welborn Sur. .... S.D. 2,280 ft.
Olds & King's No. 2 Anthony, John C. Byers Sur. ..... Began 10-28; set 10-in. 60 ft.
John C. Rogers et al's No. 1 W. Q. Henderson, 3,100 ft. S, 3,100 ft. E, NW cor., Wm. Davis Sur. ..... S.D. 955 ft.
United North & South Co.'s No. 1-A Nickelberry, W. A. Irvin Sur., 300 ft. S and E, NW cor., Nickelberry 50-ac. tr. ..... Dry and abnd. 4,145 ft.

HARRISON COUNTY

Lloyd Oil Corp.'s No. 1 E. S. Timmons, 150 ft. from N line to 250 ft. from E line of 105-ac. tr., Findley Sur. ..... S.D. 3,432 ft.
Ryan Consolidated Pet. Corp.'s No. 1 J. M. Fuhr, 1,-300 ft. N of NW cor. T. J. Copelin Sur., 1,675 ft. SW at right angles to NW SE line of O'Neal Sur. .. Derrick.

MARION COUNTY

Gist, Claunch & Dodson's No. 1 Miller, 1,470 ft. E line, 725 ft. N line, SW cor. H. Fulgran H.R. Sur. ..... S.D. 200 ft.
Geo. Hindeman et al's No. 1 F. V. Lindsey, 2,500 ft. S, most northerly N line, 3,555 ft. E most easterly W line, Alexander Albright Sur. ..... S.D. 2,380 ft.

PANOLA COUNTY

Hoffer et al's No. 1 Cameron Lbr. Co., center 1,306-ac. tr. in W. M. A. LaGrove Sur. ..... Derrick.
Moses & Wallace's No. 1 Daniel, 600 ft. N and W lines, Mrs. Gerrell 100-ac. tr., SW cor. Isabel Hanks Sur. .. Spudded and S.D.
G. A. Davidson's No. 1 Latham, Wm. Rich Sur. ..... S.D. 1,548 ft.
J. L. Nelson et al's No. 1 J. W. Williams, 300 ft. S, 700 ft. W, NE cor. Williams' 67-ac. tr. in Jas. Hanks Sur. ..... S.D. 2,250 ft.
United Gas Public Service Co.'s No. 11 Werner, 1,162 ft. N, 2,418 ft. W, SE cor. D. B. Lewis Sur. ..... Coring 4,688 ft.

RED RIVER COUNTY

D. M. Buffington's No. 1 Hosaler, E. Hughhart Sur. .... S.D. 2,795 ft.
Johnson Pet. Co.'s No. 2 Randolph, Edw. Dean Sur. ..... S.D. 2,280 ft.

SHELBY COUNTY

E. L. Chapman's No. 1 Pickering Lbr. Co., C. E. Henry (headright) ..... Set 5 3/16-in. 3,102 ft.
Chapperell Oil Co.'s No. 2 Holt, Matthew Moore Sur. .. Arrng. resume drlg. 3,127 ft.
Harry Elliott's No. 1 Pickering Lbr. Co., 1,000 ft. N, 150 ft. E, SW cor. 361ac. tr., G. H. Patterson Sur..... Rigging up.
K. H. Francis' No. 1 John Mims, Mary Smith Sur. ..... S.D. 2,750 ft.
H. H. Gracey's No. 1 J. A. Morrison, 1,500 ft. N, 200 ft. E, SW cor. J. A. Morris' 109-ac. tr., Wm. English Sur. ..... S.D. 2,600 ft.
Henry Maulding's No. 1 Frost Lbr. Co., NE cor. Frost Lbr. Co.'s 80-ac. tr., A. D. Fountain Sur. ..... S.D. 3,246 ft. (corrected)
McRoby et al's No. 1 Windham, Wm. Leach Sur., on Windham 296-ac. tr. ..... Testing 2,704 ft.
Ridgeway et al's No. 1 Polley, Domingo Gonzales Sur., 3,180 ft. E of SW cor., 160 ft. N at right angles of Polley 457-ac. tr. ..... Trying to kill fresh water flow 822 ft.
A. D. Smith's No. 1 Y. D. Carroll-J. A. Parker Sur., 1,500 ft. N, 300 ft. W, SE cor. J. A. Carroll Sur. ... Dry and abnd. 3,240 ft.
C. H. Tautenhahn's No. 1 J. C. Bogard, 300 ft. S, 900 ft. E, NW cor. J. C. Bogard's 52-ac. tr., Thomas Baker Sur. ..... S.D. 20 ft;
Tenant et al's No. 1 J. Henry, C. Z. Walker Sur. ..... S.D. 3,457 ft.
United North & South Prod. Co.'s No. 1 Windham, 800 ft. W, 1,050 ft. N, SE cor. of Windham 171.5-ac. tr. on A. H. English Sur. ..... Coring 2,682 ft.

WILDCAT OPERATIONS IN SOUTHWEST TEXAS

(Continued from Page 61)

Dr. Ewell Neil's No. 1 J. Watson, 500 ft. from W line, 1,700 ft. from S line of B. Martinez Sur. ..... T.D. 1,700 ft.; drlg.
Schneider, Rees et al's No. 2 Claussen, 12 miles NE of San Antonio ..... T.D. 1,050 ft.; drlg.
Tri-State Oil Co.'s No. 1 E. B. Carruth, 2,500 ft. from S line, 2,560 ft. from E line of tr. in F. Bolen Sur. ... T.D. 770 ft.
S. W. Blount's No. 1 S. A. Land Co., I. Perez Sur., 1,000 ft. to N line, 450 ft. to W line of tract..... T.D. 300 ft.; drlg.
Crawford & Terrell's No. 1 L. F. Ridder, 1,200 ft. to N line, 900 feet to S line of 700-acre tract, J. A. Baerera Sur. ..... Location.

CALDWELL COUNTY

Ralph Ogden's No. 1 Nealson, 150 ft. from N and E lines of farm, in John B. Gray Sur. ..... T.D. 1,314 ft; abd.
Ralph R. Lewis' No. 1 Keith McGee, 600 ft. from E and S lines of tr. in J. Pinchback Sur. ..... T.D. 50 ft; laying wtr. line.

COMAL COUNTY

Caldwell & Lanier's No. 1 T. J. Byler, 175 varas from W line, 370 varas from N line of 320-ac. tr. in the H.E.&W.T. No. 5,894 Sur. ..... T.D. 722 ft.; dropped from reports.

DEWITT COUNTY

Gibson & Sturm's No. 1 Clark, Dolores Alderete Sur. .... Rigged up; standing.

DUVAL COUNTY

Thomas & Tarver, Inc.'s No. 1 Wood-Welder, 500 ft. to N line, 4,320 ft. to W line of Sur. No. 102 ..... T.D. 2,150 ft.; in sand, showing gas.
S. J. Carpenter et al's No. 1 Juan Benavides, Blk. 33, Mesquite grant ..... T.D. 1,712 ft; standing.
Frank Gravis' No. 1 Shallert, Sur. No. 255 ..... T.D. 1,450 ft.; abnd.

FRIO COUNTY

A. H. Wray's No. 1 Roche, 330 ft. from N and W lines of NW SE, Sec. 123, A. Hutzler Sur. ..... T.D. 3,100 ft.; standing.

GUADALUPE COUNTY

Pray & Campbell's No. 1 Kruger, 150 ft. to E line and 150 ft. S of Guadalupe River ..... Rigging up.
Barnhill et al's No. 1 H. L. Hoffman, 450 ft. to N and W lines of farm, in John G. King Sur. ..... T.D. 300 ft.; drlg.
Bolling et al's No. 1 J. E. Lennie, 850 ft. from E line, 1,050 ft. from S line of farm, in Cortario Sur. ..... T.D. 1,859 ft.; abnd.
Harry Bruner's No. 2 Jim Sherrill, 330 ft. from NW and SW lines of tr. in Geo. Allen League ..... T.D. 180 ft; standing.
McGarrity et al's No. 1 A. Wesch, Jr., 150 ft. to N and E lines of farm, H. M. Thompson Sur. ..... T.D. 1,400 ft.; dropped from reports.
Schleyer, Atherton and Armstrong's No. 1 Ogletree, Robert Smith Sur. ..... T.D. 1,745 ft; S.D.
M. W. Eiser's No. 1 Wells, 2,790 ft. to W line, 150 ft. to S line of farm in Jose de la Baume Sur. ..... Rigging up.

GOLIAD COUNTY

Plymouth Oil Co.'s No. 1 Parks, 5 miles NE Goliad..... T.D. 675 ft.; set surface csg.
Camp and Stanolind's No. 2 Pettus, 1,589 ft. N, 63 degrees 46½ minutes W of No. 1 ..... T.D. 4,520 ft; abd.
Neal et al's No. 1 J. M. Pettus, 10,700 ft. to S line, 2,500 ft. to E line of Pedro Trevino Sur. ..... T.D. 410 ft.; set surface csg.

HAYS COUNTY

J. C. Jones et al's No. 1 Byder, John Ingram Sur. ..... T.D. 930 ft.; abnd.

JIM WELLS COUNTY

Stanolind O. & G. Co.'s No. 1 N. A. Hoffman, 6,800 ft. from S line, 10,000 ft. from W line of most easterly NE cor. of 7,000-ac. ranch in La Trinidad Sur. ... T.D. 5,175 ft.; drlg.

KENDALL COUNTY

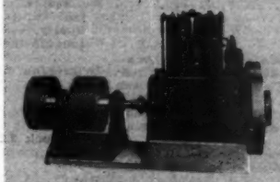
Borgett et al's No. 1 W. Haag, 3,804 ft. from N line, 1,506 ft. from W line of W. Avery Sur. ..... T.D. 1,245 ft; S.D.
Dixon Oil Co.'s No. 1 Ottmar Behr, 823 ft. from S and N lines of Jessie Wilson Sur., 3 miles S of Sisterdale ..... T.D. 2,708 ft; standing.
Sitton et al's No. 1 Garvin, C of NE of D. L. Richardson Sur. in the D. L. Richardson Sur., 1 mile NE from Kendalia ..... T.D. 1,482 ft; S.D.
Fred S. Dibble's No. 1 Ellebrach, Sur. 77, N part of county ..... T.D. 50 ft; S.D.
Sartin's No. 1 Lawhon, 30 ft. SE of Perkins' No. 1 Lawhon; taken over at 281 ft. ..... T.D. 575 ft.; abnd.

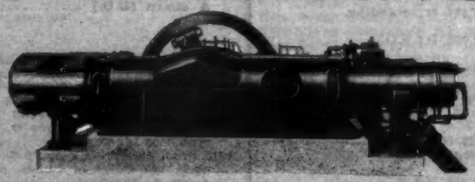
KERR COUNTY

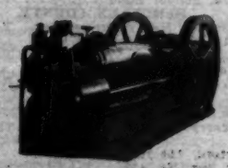
Herbert Oil Co.'s No. 1 J. D. Witt, 1,320 ft. N line, 1,320 ft. W line of Sec. 1,923, W. H. Hamilton Sur. .. T.D. 200 ft; standing.

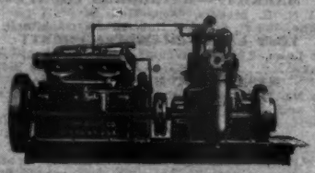
CLARK

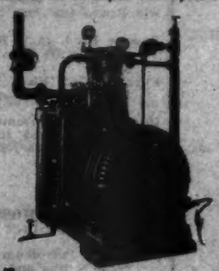
· ENGINES and COMPRESSORS

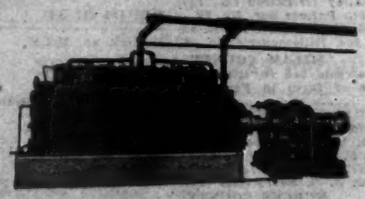

Vertical Pumping Engine

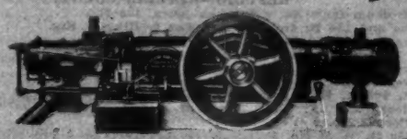

200 B. H. P. Super Two-Cycle Twin Compressor

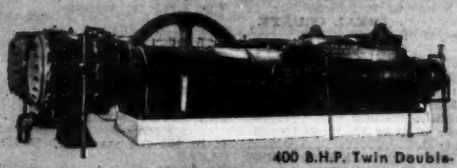

40 H. P. Pumping Engine

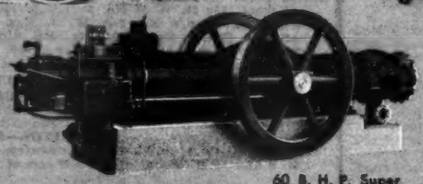

Vertical Compressor

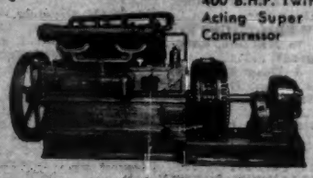

Motor Driven Vertical Compressor

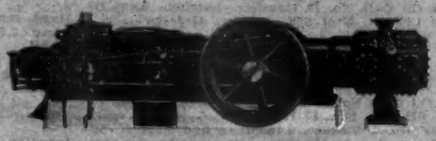

Eight Cylinder Vertical Engine

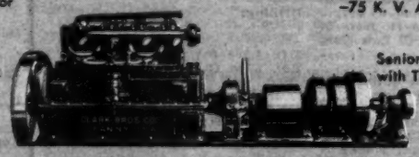

100 B. H. P. Super Two-Cycle Compressor


400 B.H.P. Twin Double-Acting Super Two-Cycle Compressor


60 B. H. P. Super Two-Cycle Compressor


Gas Engine Generator Unit —75 K. V. A.


200 B. H. P. Double-Acting Super Two-Cycle Compressor


Senior Drilling Engine with Two-speed Clutch

Efficient · Accessible · Durable

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Foreign Offices: Clark Bros. Company, London; Balkan States Trading & Importing Co., Bucharest, Roumania

Evans & Gant's No. 1 Selker-Mears, C.C.S.D.&N.G.R.G. Sur. No. 1,805 ..... T.D. 4,031 ft; S.D.
Evans & Gant's No. 1 E. Young, A. E. Burge Sur. No. 28 .. T.D. 1,312 ft; standing.
Evans & Gant's No. 2 Love, 150 ft. S and W line of Sur. 1,593 ..... T.D. 4,018 ft.; drlg.

KARNES COUNTY

V. F. Neuhaus' No. 1 Russell, 150 ft. to E line, 150 ft. N of Highway, in Carlos Martinez Sur. ..... T.D. 1,804 ft.; S.D.
United North & South's No. 1 Morrell, 330 ft. from W line, 990 ft. from S line of tr. in Carlos Martinez Sur. ..... T.D. 2,482 ft.; reaming.

LA SALLE COUNTY

Buckley Ranch O. & G. Co.'s No. 1 Buckley, 200 ft. from S line, 330 ft. from W line of Sur. No. 37 ..... T.D. 3,600 ft.; coring.

LIVE OAK COUNTY

Henderson Coquat's No. 1 Hewitt ..... T.D. 400 ft; standing.
V. G. Schimmel's No. 1 Terrell in Mark Killely Sur. ..... 800 ft.; drlg.
Phillips Petroleum and Henderson Coquat's No. 1 Sanger, 150 ft. to most S of N lines, 2,000 ft. to W line of tract ..... Location.

LEE COUNTY

A. H. Wheeler and associates' No. 1 fee, Blk. 47, H. Donohue Sur. ..... T.D. 3,525 ft; S.D.
C. B. Polk et al's No. 1 Stoltz, Hiram Donohue Sur. .... T.D. 2,300 ft; S.D.
Chadwick et al's No. 1 Hickey, 1,000 ft to NW line, 300 ft. to NE line of farm in Warreiman Sur. ..... T. D. 20 ft.; spudded in.

MAVERICK COUNTY

I. N. Boicourt's No. 1 Bandera, School Land ..... T.D. 2,284 ft; standing.

McMULLEN COUNTY

Whall, Scherer et al's No. 1 Shiner, Henry Brewer Sur... T.D. 2,008 ft; S.D.
A. E. Adams' No. 1 Martin, 150 ft. NW line, 150 ft. to SW line of E. Melon No. 212 Sur. ..... T.D. 363 ft.; abnd.
Jacob, Buzzini & Pickett's No. 1 Jacob in NE part of county ..... Rigging up.

MEDINA COUNTY

Frank A. Brown's No. 1 Fohn, 150 ft. from E line, 790 ft. from N line of J. F. Torry Sur. No. 113 ..... T.D. 922 ft; twisted off drill stem; fishing.
Genard Bros.' No. 1 L. Crawford, 150 ft. to N and W lines of tr. in J. Keppler Sur. No. 478 ..... T.D. 2,240 ft.; S.D.
J. H. Hickey's No. 1 Jungman at N end Chicon Lake.... T.D. 650 ft; S.D.
Star Pet. Co.'s No. 1 Medina Valley Irrigation Co., 150 ft. from S and E lines of Isom Palmer Sur. No. 20.... T.D. 825 ft; S.D.
C. J. Webster Oil & Gas Co.'s No. 1 Adams, 2,450 ft. to N line, 160 ft. to E line of Jos. Hillemeyer's No. 25.. Derrick up, M.I.M.

MILAM COUNTY

Dil-Tex Oil Corp.'s No. 1 E. Lawson, 560 ft. from NE and 270 ft. from SE lines of farm in Fernando Rodriguez Sur., near Cause ..... T. D. 2,550 ft.; standing.
H. W. Elliott's No. 1 Marek, 767 ft. from N line, 500 ft. from W line of 160-ac. tr. in B. Wickson Sur. ..... T.D. 1,456 ft.; S.D.
Nowlen's No. 1 Beard, 1,350 ft. from SE line, 450 ft. from SW line of farm, in J. F. Guthrie Sur., 4 miles S Thorndale ..... T.D. 2,036 ft; S.D.
Red Bank Oil Co.'s No. 1 Foster, A. G. Berry Sur. ..... T.D. 4,685 ft.; abnd.; lost hole.

NUECES COUNTY

Southern Crude Oil Pur. Co.'s No. 1 Chas. E. Stratton, 1,650 ft. E line, 330 ft. S line of P. Sancho Sur. .... T.D. 4,765 ft; testing.

REAL COUNTY

McGinley Corp.'s No. 1 Haby, C of SW, Sec. 175 ..... T.D. 2,530 ft; S.D.

TRAVIS COUNTY

Bass & Speed's No. 1 R. T. Nagel, L. Kimbro Sur. ..... T.D. 700 ft.; abnd.
Bass & Speed's No. 1 Joe F. Nagle, 750 ft. from SW line, 450 ft. from NW line of farm in L. Kimbro Sur.. T.D. 895 ft; abd.
C. R. Franklin et al's No. 1 J. Wilson, 160 ft. from N and W lines of farm in A. Alexander Sur. ..... T.D. 1,130 ft.; drlg.
Ray & Henze's No. 1 Hatech, in C of tr. in S. Hamilton Sur. ..... T. D. 360 ft.; standing.
Waldron et al's No. 1 T. Cook, 900 ft. from NW line, 3,500 ft. from SW line of D. H. Minor Sur. ..... T.D. 1,420 ft.; drlg.

WEBB COUNTY

O. W. Killam's No. 3 Bruni, 9,195 ft. to NE line, 6,890 ft. to SE line of tr. in Borrego grant ..... T.D. 1,845 ft.; abnd.
Power & Dettenhaim's No. 1 Cowan & Goss, 1,870 ft. from W line, 1,656 ft. from N line of Sur. No. 1,606.. T.D. 150 ft; drlg.
Winfield Killam's No. 1 Killam, Blk. 18, Sur. 1,613, near Reiser ..... T. D. 2,050 ft.; drlg.
Cole Pet. Co.'s No. 4 Benavides, 2,480 ft. to E line, 160 ft. to S line of Sur. No. 1,613 ..... T.D. 4,050 ft; S.D.
Fansler, Johnson & Peacock's No. 1 Laurel, 425 ft. to N line, 600 ft. to E line of Blk. 10, Sur. 271 ..... Rigging up.

WILLIAMSON COUNTY

Burns et al's No. 1 Wilder, 1,800 ft. to N line, 200 ft. to W line of tr. in H. Owens Sur. ..... Drilling.
Hays & Gee's No. 1 E. G. Johnson, 1,800 ft. from N line, 170 ft. from E line of tr. in B. C. Low Sur., S of Georgetown ..... T.D. 1,565 ft.; drlg.
H. Fritz' No. 2 fee, 35 ft. N of No. 1 fee ..... T.D. 1,100 ft.; abnd.
McLean's No. 1 R. C. Miller, 300 ft. from S line, 150 ft. from W line of farm in Manlove Sur. ..... T. D. 1,700 ft.; shut down.
Nowsman et al's No. 1 Cruse, 500 ft. to NW line, 150 ft. to NE line of farm in H. W. Eubanks Sur. ..... T.D. 1,612 ft; abd.
R. S. Wilson's No. 1 Speckles, 150 ft. N of road, 600 ft. from W line of farm in J. Jordan Sur., 1 mile N of Coupland ..... S.D. 875 ft.

WILSON COUNTY

A. M. Blume's No. 1 Nickolson, C. Diaz Sur. ..... T. D. 1,600 ft.; shut down.

ZAPATA COUNTY

Ballard & Mercer's No. 1 Flores, 500 ft. from NE line, 550 ft. from SE line of Blk. 27, Porcion 37 ..... Rigging up.
M. D. Slator's No. 1 Slator, 1,000 ft. from SE line 1,200 ft. from SW line of Blk. 25, J. V. Borrego grant .... T.D. 1,000 ft; drlg.
F. H. Etheridge's No. 1 Henne-Winch, in Sur. No. 286.. T.D. 1,900 ft; drlg.
T. H. Ward's No. 1 Uribe, 150 ft. NW line, 150 ft. SW line, Blk. 8 Subd., Share 7, Porcion No. 6, T. Uribe Partition of Jose V. Borrego Sur. ..... Rigged up and standing.
Bill Henry et al's No. 1 Gopher Trust estate, Borrego grant ..... T.D. 1,525 ft; standing.
National Oil Co.'s No. 1 Zapata Trust estate, 617 ft. NW line, 95 ft. NE line, Blk. 97, De Prom Subd., Porcion 6 ..... T.D. 600 ft; standing.
National Oil Co.'s No. 2 Adams, 150 ft. from NW line and SW line, Blk. 11, Borrego grant ..... T.D. 1,320 ft; standing.
Newton, Owens & Evans' No. 1 Garza, 200 ft. to N line, 300 ft. to W line of Blk. 4, Share 1, Sur. 161 ..... T.D. 1,758 ft.; drlg.
United Prod. Co.'s No. 10 Measles, 1,000 ft. to NE line, 1,550 ft to SE line of Sur. No. 207 ..... Drlg.

GULF COAST FIELDS AND WILDCATS

(Continued from Page 59)

PIERCE JUNCTION—HARRIS COUNTY

Gulf Production Co.'s No. 33 Taylor, James Hamilton Sur. No. 52, 200 ft. E of No. 32 and 50 ft. from S line ..... Drlg. sticky shale 3,782 ft.
Rio Bravo Oil Co.'s No. 22-A Settegast, J. Kopman Sur. No. 44, 900 ft. S and 200 ft. W of NE cor. "A" lease (D.D.) ..... Drlg. sand 4,308 ft.
Southern Petroleum Co.'s (Tilton et al) No. 1 N. C. Barnes, B.B.B.&C. Sur. No. 1,028, 15 ft. from N line and 25 ft. from W line of Blk. 49, Jones Subd... No report.

BLUE RIDGE—FORT BEND COUNTY

Coronado Oil Co.'s No. 2 Blakely, 430 ft. W, 575 ft. N of SE cor. of Lot 8, Blk. D, E. Drew Sur. ..... Rig.

HIGH ISLAND—GALVESTON COUNTY

Yount Lee Oil Co.'s No. 20 Cade, N. Fitzsimmons Sur., 161 ft. W of No. 15 and 146 ft. SW of No. 17 ..... Shut down 60 ft.
Yount Lee Oil Co.'s No. 22 Cade, N. Fitzsimmons Sur., 125 ft. S of No. 21 ..... No report.
Yount Lee Oil Co.'s No. 23 Cade, N. Fitzsimmons Sur., 300 ft. S of No. 22 ..... No report.

DAMON MOUND—BRAZORIA COUNTY

Layne et al's No. 8 Wisdom, 155 ft. from NW line and 150 ft. from NE line, Lot 52, Blk. D, Wisdom Subd., A. Darst Sur. ..... Fishing bit 3,326 ft.
The Texas Co.'s No. 1 Cave hrs., 75 ft. SW, 150 ft. SE at right angles from N cor. of Lot A, Blk. 73, Wisdom Subd., A. Darst League ..... Rig.

ORCHARD—FORT BEND COUNTY

Gulf Production Co.'s No. 30 Moore, Mark Smith Sur., 400 ft. N and 600 ft. W of No. 29 ..... Set screen 3,596 ft.; comp. flowing 1,200 bbls. pipe line oil on one-half inch choke.

ORANGE—ORANGE COUNTY

Jefferson Prod. Co.'s No. 1 Bland ..... Sandy shale 2,980 ft.; drill stem stuck.

LOCKWOOD—FORT BEND COUNTY

Cullen & West and Gulf Prod. Co.'s No. 2-A Lockwood & Sharp (D.D.) ..... Set 136 ft. of 4½-in. screen 5,151 ft.; comp. flowing 136 bbls. hourly, 400 lbs. pressure, three-fourths inch choke.
Cullen & West and Gulf Prod. Co.'s No. 3-A Lockwood & Sharp, J. Rabb Sur., 600 ft. E of No. 2-A.. Drlg. sand rock 4,612 ft.
Cullen & West and Gulf Prod. Co.'s No. 4-A Lockwood & Sharp, J. Rabb Sur., 550 ft. W of No. 2-A ..... Derrick.
Cullen & West and Gulf Prod. Co.'s No. 2 H. P. Lockwood, J. Rabb Sur., 300 ft. N and 900 ft. W out of SW cor. 283-acre tract ..... Drlg. rock 2,211 ft.
Gulf Prod. Co.'s No. 1 Mary D. Booth Meyers, J. Rabb Sur., 300 ft. N of Cullen & West's No. 2-A Lockwood & Sharp ..... Rig.

SARATOGA—HARDIN COUNTY

Rio Bravo Oil Co.'s No. 21-A Cotton ..... Rig.

MARKHAM—MATAGORDA COUNTY

Powers Prod. Co.'s No. 1 N. R. Meyers, Wm. Hadden Sur., 750 ft. from E line, 300 ft. from N line, Blk. 6.. Spudded.

LOST LAKE—CHAMBERS COUNTY

Pure Oil Co.'s No. 6 Lost Lake, 2,381 ft. W and 289 ft. S of No. 5 in Lost Lake ..... Drlg. sticky shale 4,690 ft.

NASH—FORT BEND COUNTY

Harrison & Abercrombie's No. 15 Nash, Thomas Alsbury S League, 450 ft. E and 75 ft. S of Rycade Oil Corp.'s No. 13 Nash ..... Set 60 ft. of 6⅝-in. screen 4,84[illegible] ft., with 4½-in. liner to top; comp. flowing 1,200 bbls. pipe line oil, 325 lbs. pressure, one-half inch choke, 23.6 gravity.

MOSS BLUFF—LIBERTY AND CHAMBERS COUNTIES

Gulf Production Co.'s No. 4 McFaddin, J. McFaddin Sur... Drlg. shale 5,877 ft.

REFUGIO—REFUGIO COUNTY

Larco Gas Petroleum Co.'s No. 4 Strauch heirs, 150 ft. from N line and 150 ft. from W line, Lot 6, Blk. 2.. Rig.
Mission Drilling Co.'s No. 3 J. J. O'Brien, Refugio town tract, 150 ft. from N line, 150 ft. from E line of 12½-ac. tract ..... Rig.
Moody-Seagraves Prod. Co.'s No. 2-A St. John, Refugio town tract, 600 ft. E of No. 1-A and 300 ft. from N line of lease ..... Drlg. hard sand rock 3,359 ft.
United Prod. Corp.'s No. 6 O'Brien, 150 ft. from S line of tract, 350 ft. W of No. 3 ..... Abandoned 6,451 ft.
United Prod. Corp.'s No. 2-A W. J. Fox, Wm. Hews and L. Brown Sur., 2,099 ft. NE along SE line from SE cor. of lease, thence 1,690 ft. NW at right angles ..... Drlg. sandy shale 5,549 ft.

SOUTH LOUISIANA FIELDS

LOCKPORT—CALCASIEU PARISH

Vacuum Oil Co.'s No. 32 Miller, 925 ft. E and 480 ft. S of NW cor. S half of NW of Sec. 9-10s-9w ..... Spudded.

JENNINGS—ACADIA PARISH

Jennings Pet. Co.'s No. 2 Eunice Crowley (W.O.), 325 ft. S and 50 ft. W out of the NE cor. of Sec. 42-9s-2w. Tested salt water 4,254 ft.; pulling screen to deepen.
Yount Lee Oil Co.'s No. 10 Housierre-Latrielle, 5,435 ft. E and 1,070 ft. N of SW cor., Sec. 47-9s-2w ..... Hard sand 7,794 ft; cmtd. 7-in. csg. 7,740 ft.; drlg. plug.

SORRENTO—ASCENSION PARISH

Gulf Ref. Co.'s No. 20 United Land Co., 4,040 ft. N and 760 ft. W, SE cor., Sec. 15-10s-4e ..... Drlg. gumbo 2,226 ft.

HACKBERRY—CAMERON PARISH

Calcasieu Oil Co.'s No. 28 Watkins, 1,070 ft. N, 1,742 ft. W of SE cor., Sec. 13-12s-10w ..... Drlg. rock 3,126 ft.
R. E. Seims' No. 2 Vincent, 2,195 ft. S and 1,220 ft. W of NE cor. Sec. 30-12s-10w ..... Location.
R. E. Seims' No. 2 J. M. Vincent ..... Shut down 2,162 ft.
Yount Lee Oil Co.'s No. 44 State, 1,110 ft. N and 1,915 ft. W of SE cor., Sec. 13-12s-10w ..... Location.
Yount Lee Oil Co.'s No. 45 State, 1,220 ft. N and 810 ft. W of SE cor., Sec. 13-12s-10w ..... Location.
Yount Lee Oil Co.'s No. 46 State, 1,280 ft. N and 1,555 ft. W of SE cor., Sec. 13-12s-10w ..... Location.
Yount Lee Oil Co.'s No. 47 State, 1,420 ft. N and 1,408 ft. W of SE cor., Sec. 13-12s-10w ..... Location.

VINTON—CALCASIEU PARISH

Marrs McLean's No. 9 Gray (D.D.) ..... Drlg. sand 1,600 ft.
Vinton Pet. Co.'s No. 10 Gray (W.O.) ..... Coring sand 3,427 ft.

SWEET LAKE—CAMERON PARISH

Pure Oil Co.'s No. 5 Sweet Lake (D.D.), Sec. 12-13s-8w.. T.D. 5,658 ft.; sidetracking in sand and shale 4,083 ft.

MISCELLANEOUS WILDCATS

TEXAS

AUSTIN COUNTY

O'Hara Oil & Gas Co.'s No. 1 Nellous, J. C. Cummings-Hacienda Sur., 650 ft. N of No. 1 Schroeder in 18-acre tract, north edge Mill Creek ..... Derrick.
Pomacal & Boletka's No. 1 Schebajsa, 329 ft. N, 78 degrees E of N cor. B. Dottery Sur., near center of SW line of S. F. Austin 4 League on west fork of Mill Creek ..... Rig.

BRAZORIA COUNTY

The Texas Co.'s No. 2 Belcher, Harvey N. Little Sur., 1,728 ft. southeasterly from N cor. of S half of Sur., along NE line and thence 123 ft. at right angles.... Derrick.
United Oil Syndicate's No. 1 Levitt, 900 ft. from W line and 400 ft. from S line of John Peake Sur. ..... T.D. 1,594 ft. in gumbo; drill-stem stuck.

BURLESON COUNTY

Marek & Son's No. 3 A. Marek, N. McFaddin Sur., 1,068 ft. N and 225 ft. W of SE cor. of tract ..... No report.
Marts et al's No. 1 W. H. Boyett, W. McWilliams Sur., 3,168 ft. N of N cor. of City National Bank 208-acre tract and 300 ft. SE of NW line of Boyett tract.. S.D. 3,006 ft.

FORT BEND COUNTY

Stone & Wyman's No. 1 Beard, H.&T.C. Sur. No. 118, 1,150 ft. from NW line and 1,892 ft. from NE line .. Shut down 1,275 ft.; 2 joints drill stem lost in hole.

GRIMES COUNTY

Rianjo Oil Co.'s No. 2 Cuthrell, Pat B. O'Connor Sur., C of 110-acre tract ..... Drlg. hard sticky shale 3,103 ft.

HARRIS COUNTY

Givens & Dalybault's No. 1 Lobit, David Middleton Sur., Blk. 19, Lobit Subd. ..... Drill stem stuck 2,452 ft.
Humble Oil & Ref. Co.'s No. 2 Irwin (D.D.), Mykawa, Wm. Lovett Sur. ..... Abandoned 6,401 ft.
Humble Oil & Ref. Co.'s No. 5 Minnetex, Mykawa, 150 ft. from S line and 200 ft. from W line, Lot 261, Wm. Lovett Sur. ..... Location.
Louisiana Oil & Dev. Co.'s No. 1 J. W. Wilson, W. Ritchie Sur. ..... Location.
Shubert & Alexander's No. 1 Herman Hale, 1,058 varas E of NW cor. R. A. Hanks Sur., thence 790 varas S and thence 70 varas W 74 degrees ..... Shut down in gumbo 2,206 ft.

JACKSON COUNTY

Chicago-Gulf Oil Co.'s No. 9 Drushell, Edna F. Rodriguez Sur., 1,080 ft. N, 58 degrees E No. 8 ..... Gas sand 2,635-40 ft.; cem. casing.

JASPER COUNTY

Hext Drlg. Co.'s No. 1 Flourney, B. F. Jones Sur., 600 ft. NW of Helmerich & Payne's No. 1 Flourney ..... No report.

JEFFERSON COUNTY

Humble Oil & Ref. Co.'s No. 1 Nelson, Wm. Rice Sur., 550 ft. from N line and 50 ft. from E line of W half of 1,071-ac. tract ..... Drlg. shale 3,614 ft.
John I. Pipkin and Elam's No. 1 Broussard, McGaffey Sur., 800 ft. from S line in center E and W of 206-ac. tract ..... No report.
Texas Gulf Sulphur Co.'s No. 1 Thompson, Fannett, Wm. Smith Sur., 1,950 ft. W and 1,600 ft. S of NE cor. of Thomas 446-acre tract ..... Sulphur test.
Texas Gulf Sulphur Co.'s No. 1 Thomas Fannett, Wm. Smith Sur., 1,950 ft. W, 1,600 ft. S of NE cor. of Thomas' 446-ac. tr. ..... Sulphur test.
Westbury Oil Co.'s No. 4 West, 450 ft. W and 4,210 ft. S of NE cor. of T. D. Yoakum Sur. ..... S.D. in gumbo 600 ft.

LIBERTY COUNTY

L. B. House's (I. R. Ingram) No. 1 C. T. Palmer, James Fenner Sur., 1,000 ft. from W line and 850 ft. from S line of tract ..... Shale 3,158 ft.
Hamm et al's No. 1 Harvard, Davis Hill ..... Gumbo 1,015 ft.; S.D.

MATAGORDA COUNTY

United North & South Oil Co.'s No. 1 Stoddard, J. C. Keller Sur., 150 ft. W and 545 ft. N of SE cor. Blk. 53, Buckeye townsite ..... Drlg. sticky shale 5,153 ft.
Harvey Smith's No. 1 Boker (Citrus Grove), J. V. Criswell Sur., Robbins Subd., 2,000 ft. S and 2,000 ft. E of NW cor. of Lot 14 and Lot 15 ..... Coring sand 1,926 ft.

MONTGOMERY COUNTY

Hogg Bros.' No. 1 Sealey, Jas. Pevehouse Sur., 1,575 ft. N of N line of Horton & Woodson's 1,562-ac. tr., and 2,226 ft. E of W line of H. & W. 1,870-ac. tr. ..... Drlg. shale 608 ft.
Humble Oil & Ref. Co.'s No. 1 W. A. Penn, 750 ft. from N line and 900 ft. from E line of S. J. McFarland Sur. ..... Drlg. shale 4,162 ft.
Stanolind Oil & Gas Co.'s No. 1 R. M. Gary, Jacob Shannon Sur., 150 ft. SW of SW cor. D. Pitts 91-acre tract in R. M. Gary 633-acre tract ..... Location.
Strake et al's No. 1 South Texas Dev. Co., 468 ft. in westerly direction along N line of Theo. Slade Sur. from SW cor. of A. McGowan Sur., and thence 750 ft. in southerly direction at right angles from said line in Slade Sur. ..... Coring shale 4,676 ft.

ORANGE COUNTY

Altex Oil Co.'s (Veteran Oil Co.) No. 1 Reed, A. Nelson Sur. No. 1, 500 ft. from N line and 250 ft. from E line of tract ..... T.D. 4,063 ft.; sidetracked 1,200-2,200 ft.; S.D.
Crew Oil Co.'s No. 1-A Mansfield, 50 ft. E of No. 1 ..... No report.

POLK COUNTY

Freeman et al's No. 2 Freeman ..... S.D. 3,162 ft.
T. B. Hoffer's No. 1 Saner-Ragly Lbr. Co., 300 ft. out of most northerly cor. of most easterly County School Land Abst. 271 ..... S.D. 1,171 ft.
Trans-Coastal Oil Co.'s No. 1 M. E. Roberts, J. F. Rumayor Sur., 350 ft. from W line and 150 ft. from N line of tract ..... S.D. 734 ft.

REFUGIO COUNTY

Blanco Creek Oil Co.'s No. 1 Damaan, 150 ft. from N line and 150 ft. from W line of Blk. 14, Bonnie View Ranch Subd. ..... Shut down 4,627 ft.
J. C. Dixon's No. 1 Peck, 450 ft. S, 150 ft. E of NW cor. of S half of Sec. 24, Bonnie View Ranch Subd., Estaban Lopez Sur. ..... Derrick.
Humble Oil & Ref. Co.'s No. 1 O'Connor, John Keating Sur., 6,012 ft. S from NE cor. along SE line of Lon T. Ross Sur., thence 7,375 ft. W at right angles in John Keating Sur. ..... T.D. 3,879 ft; cmtd. 9⅝-in. csg.

SAN JACINTO COUNTY

E. P. Edwards' No. 1 J. R. Bennett, Cold Springs ..... S.D. 750 ft.

TRINITY COUNTY

Scientific Producers Co.'s No. 1 Thompson, I.&G.N. Sur. No. 47, 50 ft. out of NE cor. of H. K. Thompson 199-ac. tr. ..... Rig.

TYLER COUNTY

King Oil Co.'s No. 1 Caswell ..... Sand and shale showing oil 1,255 ft.; cmtd. 6-in. csg. 1,218 ft.; standing.
Allied Pet. Co.'s (Texas Southern Pet. Co.) No. 3 Wilson, Mrs. E. Cherry Sur. No. 798, 1,500 varas from W line and 600 varas from N line ..... Fishing 5,025 ft.

VICTORIA COUNTY

Bunte et al's No. 1 Keeran, 3,714 ft. NE along railroad from SW line of Martin DeLeon Sur., and thence 1,600 ft. NW at right angles ..... Shut down for fuel 2,290 ft.
Houston Oil Co.'s No. 1 Conrad, T.&N.O. Sur. No. 1, 1,100 ft. from SW line and 100 ft. from NW line ..... Heaving shale 5,225 ft.
The Texas Company's No. 3 McFaddin, S 15 degrees W, 6,200 ft. and N 75 degrees W 1,850 ft. out of NE cor. John M. Rine Sur. ..... Coring sand 5,044 ft.

WALKER COUNTY

Hart Oil Co.'s No. 1 Thompson Lbr. Co., Jose Ortega Sur., 1,265 ft. S, 1,876 ft. W of SW cor. of J. B. Gibson's 71-ac. tr. ..... Drlg. water sand 215 ft.

WALLER COUNTY

McDaniel and associates' No. 1 Citizens State Bank, B.B.B.&C. Sur., C of 150-ac. tract ..... Rig standing.

WASHINGTON COUNTY

Moon & Yeager's No. 1 Hahn, 500 ft. from N line and 1,852 ft. from W line of J. H. Alcorn Sur., Abst. 3.. Drill stem stuck 3,635 ft.
Penn-Tex Oil Co.'s No. 2 Kamah Brenham, S. M. Williams Sur. ..... Shut down in anhydrite 3,490 ft.

WHARTON COUNTY

Beard & Brumblow's (Shibe & Gray) No. 1 Brown (W.O.), S of El Campo ..... Shut down 3,345 ft.
W. H. Wallace et al's No. 1 Lee, 600 ft. S and 800 ft. W from NE cor., Sec. 18, G.H.&H. Sur. ..... Drlg. shale 3,182 ft.

SOUTH LOUISIANA

ASCENSION PARISH

McElroy Pet. Co.'s No. 2 Lacey, 150 ft. S, 150 ft. W of NE cor. of Sec. 29-10s-4e ..... Drlg. sand and shale 4,160 ft.

CALCASIEU PARISH

Crawford Doyle's No. 1 Johnson, Sec. 23-9s-13w ..... S.D. 875 ft.
I. O. Davis' No. 1 Industrial, Sec. 29-9s-10w ..... Standing 6,561 ft.
Wilfred Lahay's No. 1 Jardell, Sec. 16-10s-12w ..... S.D. 3,650 ft.
Success Oil Co.'s No. 1 Hewitt, 90 ft. out of SW cor., Sec. 11-9s-11w ..... Rig.

IBERIA PARISH

Jefferson Lake Oil Co.'s No. 22 Lake Peigneur, Sec. 58-12s-5e, 600 ft. NW of No. 21 ..... Sulphur test.
Jefferson Lake Oil Co.'s No. 23 Lake Peigneur, Sec. 58-12s-5e, 600 ft. NW of No. 22 in line with No. 21.. Sulphur test.
Jefferson Lake Oil Co.'s No. 24 Lake Peigneur, Sec. 58-12s-5e, S 600 ft. 79 deg. 30 min. W of No. 23 ..... Sulphur test.

IBERVILLE PARISH

Standard Oil Co.'s No. 2 Myrtle Grove-Wilbert, Bayou Choctaw, 2,040 ft. N and 600 ft. W of center of Sec. 52-9s-11e ..... Location.
Standard Oil Co.'s No. 3 Gay, Bayou Choctaw, 4,500 ft. N and 600 ft. E of SW cor. SE of Sec. 52-9s-11e ..... Bldg. derrick.
Standard Oil Co.'s No. 6 Schwing, Bayou Blue, Sec. 73-9s-11e, 317 ft. S of No. 2 ..... Drlg. rock 5,750 ft.

LA FOURCHE PARISH

State Production Co.'s No. 1-C Mrs. W. H. Stark, Sec. 71-15s-15e ..... Sulphur test.
The Texas Co.'s No. 3 La.L.&E., Leesville, 4,439 ft. S and 468 ft. E of NW cor., Sec. 26-21s-22e ..... Rig.

PLAQUEMINES PARISH

Humble O. & R. Co.'s No. 5 Cockrell-Moran, Lake Grand Ecaille, 10,377 ft. N and 2,614 ft. W of NE cor. of Twp. 21s-26e ..... Location.
Humble O. & R. Co.'s No. 6 Cockrell-Moran, Lake Grand Ecaille, Twp. 21-26e, 5,000 ft. E of Washington Sta. ..... Drlg. rock 1,402 ft.

TERREBONNE PARISH

La. Gas & Fuel Co.'s No. 2 Minor, 3,480 ft. S and 1,980 ft. E of NW cor., Sec. 3-18s-16e ..... Drlg. sand 3,746 ft.
The Texas Company's No. 2 La.L.&E., Bay Junop ..... Drlg. sticky shale 4,040 ft.
The Texas Company's No. 4 La.L.&E., Bay Junop ..... Location.
The Texas Company's No. 10 State, Lake Barre ..... Location.
The Texas Company's No. 11 State, Lake Barre ..... Drlg. sticky shale 2,879 ft.
The Texas Company's No. 12 State, Lake Barre ..... Location.
The Texas Company's No. 14 State, Lake Barre ..... Location.
The Texas Company's No. 1 La.L.&E., Lake Barre, 2,645 ft. S and 595 ft. E of NW cor., Sec. 30-21s-20e.. Rigging up.

VERMILLION PARISH

Pure Oil Co.'s No. 2 Southwest Louisiana Land Co., 1,300 ft. E and 300 ft. S of NW cor. Sec. 4-12s-1w... Drlg. sand, shale and lime 4,525 ft.

WEST FELICIANA PARISH

Putnam Syndicate's No. 2 Como Plantation, Sec. 51-1s-4w. Shale and lime 2,050 ft.; waiting on 8¼-in. csg.

SOUTHWEST TEXAS PROVEN AREAS

(Continued from Page 61)

COLE POOL—DUVAL COUNTY

Cole Petroleum Co.'s No. 71 Benavides, 365 ft. from SE line, 442 ft. from NE line of Blk. 8, Sec. 19, Cole sub. Mariana Arispe grant ..... T.D. 1,757 ft.; tested 200 ft. oil in 10 min.; set csg.
Duval Oil Corp.'s No. 6 Bishop Cattle Co., 1,980 ft. to W line, 990 ft. to S line of N half of Sur. No. 135.... Spudding in.

WALSH POOL—JIM WELLS COUNTY

Larcro Pet. & Gas Co.'s No. 2 Wade, 800 ft. S of No. 1.. T.D. 2,929 ft; set csg.

HENNE-WINCH-FARISS POOL—JIM HOGG COUNTY

O. W. Killam's No. 2 Lopez, 150 ft. to E line, 380 ft. to N line of Sur. 255 ..... Rigging up.

CARTWRIGHT POOL—LIVE OAK COUNTY

Houston Oil Co.'s No. 14 Cartwright, 1,000 ft. W of No. 23 Cartwright ..... T.D. 5,400 ft; standing.

CHITTIM POOL—MAVERICK COUNTY

Texas Gas Utilities' No. 8 Chittim, 24 ft. S of No. 7 Chittim ..... T.D. 4,850 ft; drlg.

SAXET FIELD—NUECES COUNTY

Gulf Coast Oil Co.'s No. 1 Sagarin..... T.D. 4,638 ft.; drlg.
Gulf Coast Oil Co.'s No. 1 Elder, NW of same company's No. 1 Harrell ..... T.D. 4,897 ft.; swabbing.
Neal-Milton and Kepley Pet. Co.'s No. 1 J. N. Roark, 200 ft. to S line, 200 ft. to E. line of 106-ac. tr. ..... T.D. 4,836 ft.; milling out at 4,750 ft.
Saxet Oil Co.'s No. 1 McCampbell, 600 ft. from N and 1,900 ft. to W lines of tr. ..... T.D. 2,545 ft.; complete gasser.
Southern Drlg. Co.'s No. 1 Alexander, 200 ft. to S line, 150 ft. to E line of farm ..... T.D. 5,358 ft.; abnd.
Saxet Oil Co.'s No. 3 Donigan, north offset to Zoch's No. 1 Baldwin ..... Location.
Saxet Oil Co.'s Well ..... Set surface csg.

WELDER FIELD—SAN PATRICIO COUNTY

Atlantic Oil Prod. Co.'s No. 1 Welder, 500 ft. to N and W lines, Blk. 3, F. R. Portillo Sur. ..... Spudded in.
Welder Oil Corp.'s No. 3 Welder, 800 ft. NE of No. 2 Welder ..... T.D. 3,671 ft.; complete 35,000,000 ft.

WHITE POINT POOL—SAN PATRICIO COUNTY

Saxet Oil Co.'s No. 18 Rachel ..... T.D. 1,425 ft.; drlg.

LOS OLMOS POOL—STARR COUNTY

Los Olmos O. & G. Co.'s No. 1 Seabury, 1,800 ft. to S line, 175 ft. to E line of 686-ac. tr. in Porcion 75.... T.D. 366 ft; set csg.; waiting on cmt.
L. L. Smith No. 1 Kelsey-Bass, Blk. 8 sub. Porciones 75, 76, 77, Jurisdiction of Camargo ..... Location.

CAROLINA-TEXAS POOL—WEBB COUNTY

Carolina-Texas O. & G. Co.'s No. 10 Barnsley, 150 ft. to E line, 200 ft. to S line of Blk. 14, Sur. 268..... Derrick.
E. A. Sterling & Co.'s No. 1 de la Garza, 150 ft. from N and W lines of Blk. 30, Sur. 336 ..... T.D. 2,208 ft.; complete 14,000,000 ft. gas.
Usher Carson's No. 5 Webster, 150 ft. to N and W lines of NW quarter of SE quarter of Sur. No. 684..... T.D. 3,065 ft.; testing sand at 3,042-65 ft.

COLE POOL—WEBB COUNTY

O. W. Killam's No. 22 Bruni, 1,755 ft. to SW line, 186 ft. to NW line, Sec. 9 ..... T.D. 1,335 ft.; drlg.

ESCOBAS POOL—ZAPATA COUNTY

Pray & Chamberlain's No. 4 Garza, Blk. 1, Comitas grant. Making location.
E. K. Bateman's No. 1 M. Garza, in Comitas grant, 200 ft. to NW line, 660 ft. to NE line of Blk. 29..... Spudded in.
Trevino Oil Corp.'s No. 12-A Trevino, 665 ft. to S line, 550 ft. to W line of Blk. 15, Sur. 412..... T.D. 1,225 ft.; complete 25 bbls.
Grayburg Oil Co.'s No. 1 F. G. Martinez, 150 ft. from S and W lines of 240-ac. tract in E½ of Sur. 4..... Rigging up.
Newton, Owens & Evans' No. 1 Garza, 200 ft. to N and W line Block 4, Share 1, Sur. 161 ..... T. D. 150 ft.; drlg.
Pray & Chamberlain's No. 4 Garza, Block 1, Comitas grant ..... Derrick.

KILLAM-CUELLAR POOL—ZAPATA COUNTY

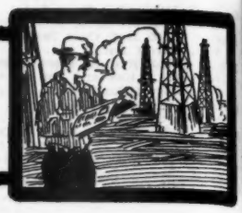
O. W. Killam's No. 45-B Cuellar, 610 ft. to SW line, 5,840 ft. to E line of Sur. 277 ..... T.D. 1,555 ft.; in sand, testing.
O. W. Killam's No. 30-A Cuellar, 570 ft. to NE line, 1,720 ft. to NW line of Cerrito Blanco grant..... T.D. 1,522 ft.; abnd.
O. W. Killam's No. 31-A Cuellar, 3,350 ft. from NE line, 475 ft. from NW line of Cerrito Blanco grant.. T.D. 1,527 ft.; drlg.

CHARCO REDONDO POOL—ZAPATA COUNTY

Bob & Richey's No. 25 Martinez, 1,300 ft. from NE line, 1,090 ft. from SE line, Block 24, Dukes sub. Charco Redondo grant ..... Location.
Bob & Richey's No. 26 Martinez, 1,460 ft. to NE line 855 ft. to SE line, Blk. 24, Duke sub. Charco Redondo grant ..... Location.
Bob & Richey's No. 27 Martinez, 870 ft. to SE line, 150 ft. to NE line, Block 24, Duke sub. Charco Redondo grant ..... Location.

CLASSIFIED WANTS

Read by Oil Men Everywhere



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3 lines	1.05	1.80	2.55	3.30
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6 lines	2.10	3.60	5.10	6.60
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9 lines	3.15	5.40	7.65	9.90
10 lines	3.50	6.00	8.50	11.00

Compute white space at the above rates.

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Mail your Classified Advertisement to

THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

FOR SALE—EQUIPMENT

FOR SALE for a low price. A gasoline powered Sullivan Diamond Core Drill. Write Box E-492, The Oil and Gas Journal, Tulsa, Okla.

200 Amp. Lincoln Arc Welded 220/3/60. Practically new. Price $425.00. 100 Amp. Federal Butt Welder; 220 V, 60 cy. Complete. Excellent condition, $500.00. 12"x14" Chicago Pneumatic Air Compressor. $350.00. 46"x18' Niles Lathe, Quick change; $1,250.00. Also, large stock of lathes, shapers, mailing machines, pipe machines, bolt threaders; etc. Send for our list. Terms to suit.
CINCINNATI MACHINERY & SUPPLY CO.
26 West Second St., Cincinnati, O.

WILL SELL at sacrifice 100 horsepower B.&W. Water Tube Boiler. Good shape. Act quick. J. W. Hooge, 158 S. Water St., Mobile, Ala.

FOR SALE—One practically new Sullivan "N" Portable Gasoline Engine Driven Diamond Core Drill. Cheap for cash. Also one "Bravo" Diamond Core Drilling Machine. Address P.O. Box 1897, Tulsa, Okla.

FOR SALE—One 4-inch U.G.-1 Worthington 3-stage centrifugal pump—with 9⅝-in. dia. impeller base and coupling. At bargain price. Address Box E-600, The Oil and Gas Journal, Tulsa, Okla.

USED EQUIPMENT FOR SALE

Casing, Linepipe, Boilers, Engines, Compressors, Derricks, Tanks, Separators, Rig Irons, Pumps, Gasoline Plant Equipment, Fittings, Valves, etc.
Low prices and quality merchandise.

USED EQUIPMENT COMPANY
1510 Philtower Bldg.,
Phone 5-3263
TULSA, OKLAHOMA

FOR SALE—Practically new Sullivan N. Core Drill at a Bargain. P. O. Box 683, Ft. Worth, Texas.

WILLIAMS Pipe Threading Machine. Cuts 1¼ to 8-in., has 5 HP Westinghouse Motor attached. Like new. Taylor Bros., 829 S.W. Fourth St., Oklahoma City, Okla.

GAS ENGINE, 100 H.P. 3-cylinder Turner Frick, direct connected to 40 K.W. Generator, used 11 months. A decided bargain. C. R. Breuer, Smelting & Refg. Co., Cincinnati, Ohio.

EQUIPMENT WANTED

WANTED TO BUY one used set of official A. P. I. Cable Drilling Tool Joint Master Gauges, size three to five inch. Answer Box E-561, The Oil and Gas Journal, Tulsa, Okla.

USED MATERIAL FOR SALE

Located Seminole and Pottawatomie Counties, Oklahoma, all equipment purchased new about three years ago, priced as is, and where is, terms Cash.

1	Braden Sectional Steel Building 36'x144'x10'	$2,500.00
1	Braden Sectional Steel Building 26'x90'x10'	1,200.00
1	Braden Sectional Steel Building 26'x50'x10'	700.00
2	Braden Sectional Steel Buildings 20'x34'x10'	500.00
1	Braden Sectional Steel Building 16'x56'x10'	700.00
1	Braden Sectional Steel Building 16'x26'x10'	250.00
1	Braden Sectional Steel Building 24'x24'x16' High	700.00
2	90 H.P. Superior Gas Engines Direct Connected to 17"x20" Compressor Cylinder, four cycle	2,500.00
12	90 H.P. Twin Cylinder Superior Gas Engines Direct Connected to 12"x16" compressor cylinders, two cycle	2,750.00
3	165 H.P. Type 10 Bessemer Twin Cylinder Gas Engines direct connected to 16¼"x20" Compressor Cyl., two cycle	4,600.00
1	35 H.P. Gas Engine, 4 cycle Superior	690.00
9	4" Centrifugal Pumps	50.00
5	10"x6"x10" Worthington Duplex Steam Pumps	200.00
1	6"x4"x6" Worthington Duplex Steam Pump	80.00
1	3"x2"x4" Worthington Duplex Steam Pump	40.00
2	4½"x2¾"x4" Worthington Duplex Steam Pumps	60.00
3	5¼"x3½"x5" Snow Duplex Steam Pumps	65.00
1	3"x2"x4" Snow Duplex Steam Pump	40.00
1	6"x4"x6" Gardner Duplex Steam Pump	90.00
2	8"x4"x12" Cameron Steam Pumps	200.00
1	5"x2½"x6" Cameron Steam Pump	90.00
1	10 H.P. F&M Type ZA Gas Engine Direct Connected to 4"x6" Pump	600.00
2	6 H.P. F&M Gas Engines Direct connected to 2¾"x4" Pumps	300.00
2	6 H.P. F&M Gas Engines Type ZA W/ Natural Gas Attach.	100.00
1	6 H.P. F&M Gas Engine Type Z-E	100.00
2	4½"x5" Vertical Compressors W/Pulley and head unloader	80.00
4	65 H.P. 150-lb. W. P. Broderick Boilers Locomotive Type	750.00
2	73 H.P. 175-lb. W. P. Acme Code Boilers Locomotive Type	900.00
25	Type A-240 Three pass Griscom-Russell Bentube Sections	280.00
1	48"x52' 75-lb. W. P. Ereco Still W/Dephlegmator and Accessories	2,750.00
1	42"x30"x41' 7" H.P. Tulsa Type Fractional Distillation Column	2,000.00
1	72"x24' Newton Blending Still	1,200.00
2	60"x24' Newton Blending Stills	950.00
4	60"x24' Newton 7 Plate Absorbers	500.00
1	72"x52' 17 Tray Gilmore Type Absorber	1,750.00
2	14" Newton Auxiliary Absorbers	200.00
3	1,600 Bbl. Wood open top Tanks	300.00
2	1,000 Bbl. Columbian 12 Gauge Steel Bolted Tanks	540.00
2	500 Bbl. Steel Bolted Tanks, Two high	225.00
3	10'x30' Steel Riveted Stock Tanks Horizontal ¼"	450.00
6	8'x26' Steel Welded Horizontal Tanks $\frac{3}{16}$"	250.00
7	5'x15' National Welded Steel Horizontal Tanks ¼" and ⅜"	100.00
2	72"x84" National Welded Scrubber Tanks ¼" Steel	90.00
4	60"x60" National Welded Scrubber Tanks ¼" Steel	80.00
2	72"x72" National Welded Scrubber Tanks ¼" Steel	90.00
3	48"x72" National Welded Scrubber Tanks ¼" Steel	50.00
4	60"x72" National Welded Scrubber Tanks	80.00
	Preheaters, Heat Exchangers, Dephlegmators, Gasoline-Water Separators, Liquid Level Controls, Meters, Regulators, Steam Traps, Line Shafts, Pulleys, Gates, Valves, Fittings, Accessories, etc. 50% today's list.	
	970' 12½" 50-lb. Plain End Casing	1.00
	21,402' 10" 35-lb. 8thd Casing	.70
	3,790' 8¼" 8thd Casing	.60
	22,150' 6" 8thd Line pipe	.40
	75,000' 2" 3.75-lb. line pipe	.08

All prices listed are per single unit and subject prior sale

For further particulars communicate with

M. E. JAMES, TRUSTEE,
P. O. Box 728
Cushing, Oklahoma.

Or call

Messrs. Carlson, James or Winget,
L. D. No. 7, Cushing, Oklahoma.

ROYALTIES—PRODUCTION

PRODUCING ROYALTIES
Specializing in East Texas
John L. Dickson, Box 1037, Tulsa, Okla.

ROYALTIES PRODUCTION

Royalty; Leases; Drilling Contract. City Field. Big producing area. O. O. Milliken, Box 63, Oklahoma City.

CLASSIFIED DISPLAY RATES

The rate for Classified Display Advertising set in similar style to this Ad or in two Column style is as follows for each insertion:

1 inch	1 time	$5.00
1 inch	13 times	4.50
1 inch	26 times	4.00
1 inch	52 times	3.50

Rates for Classified without display shown on opposite column.

One point borders and ten point capitals are allowed, larger type not accepted.

Changes in copy must be in our office 10 days in advance of publication date.

Mail your advertisement to the Largest Classified Section in the Oil Industry.

THE OIL AND GAS JOURNAL

TULSA OKLAHOMA

ROYALTIES PRODUCTION

UNUSUAL OPPORTUNITIES FOR ROYALTY INVESTORS AND DISTRIBUTORS

THE MERCURY COMPANY
Philtower Building, Tulsa, Oklahoma.

WONDERFUL OPPORTUNITY FOR A ROYALTY COMPANY

Will sell Royalty Interests in 100,000-acre spread or more already assembled, aggregating over 500 tracts in EAST TEXAS and other PROMINENT AREAS. Proper terms might be arranged if necessary. For further particulars write

G. T. Blankenship
916 Petroleum Building
Oklahoma City, Oklahoma

PRODUCTION, and nonproducing gas royalties, Stevens County, and Panhandle fields, Kansas, Oklahoma and Texas royalties. Special service for brokers. List and maps. James R. Haynes, Grantville, Kans.

JAMES B. McANALLY

Speculative and Investment Royalties

Hunt Building, Tulsa, Okla.

Service to dealers, Oklahoma, Kansas and East Texas.

LAND, the source of all wealth, the only safe investment, all royalty—on structure—new survey adjoining location—oil fields—Oklahoma County—best geology—three 40-acre tracts—one 40 sells in $100 shares. Geo. W. Seckman, Edmond, Okla.

CLASSIFIED WANTS

Read by Oil Men Everywhere

ROYALTIES PRODUCTION

PRODUCING royalties in East Texas Field for sale at $300 to $600 per acre base. Have buyers for leases, royalties and oil payments in East Texas Field. James Walker, 802 Tower Petroleum Bldg., Dallas, Tex. Phone 7-3361.

BEDROCK ROYALTY PRICES ahead of drilling on major company blocks. $6 per square mile. Perpetual deeds and title warranty. Clearly stated and understandable interests. See maps and bulletins. R. R. Fisk, Box 1214-B, Wichita Falls, Tex.

MID-CONTINENT OIL ROYALTIES
Royalties Sales Company
Suite 523
105 North Clark St.,
Chicago, Ill.

FURNISHING A REAL SERVICE

to the people of the northern and eastern metropolis who are interested in the oil industry—since 1920.

J. A. Wolfe
OIL ROYALTIES
208 So. LaSalle St.
Chicago, Ill.

AM SPECIALIZING in the sale of gas production and gas royalties in the Texas Panhandle, the largest gas field in the world. Thirty years in business here, and my business is good. Learn the reason. Write or write E. B. Reeves, Alanreed. Gray County, Texas.

SUBMIT your oil and gas royalties and leases on producing and nonproducing properties to us. We have an active buying clientele available. Frederick L. Wehrhan Associates, 500 Fifth Avenue, New York City.

PRODUCING Royalties, offsets under drilling wells, Oklahoma, Texas, Kansas. Hugoton Gas Royalty. Lists, maps. Harry Haynes, Grantville, Kans.

WILL PAY CASH for producing Royalties anywhere. Send full information. Merrick C. Ham, Pres., Lamont & Co., Ltd., 1107-8 Bartlett Bldg., Los Angeles, Calif.

ARE YOU A ROYALTY OWNER, INVESTOR, DEALER OR STOCKHOLDER?

If so, get a free copy of "The Royalty Age," the new high class monthly royalty magazine containing news and data of value to all those interested in royalties.

First number appears this month with reviews, reports, statistics maps, well logs, cross-sections and a photogravure section containing pictures of prominent royalty owners, dealers and field scenes.

Please give complete address when writing for your complimentary copy. Mail your request to "The Royalty Age," Midco Building, Tulsa, Okla.

New well starting three miles south production Joiner Pool, no dry holes between; 25-for-1 chance next few weeks. E. Croft, Proctor, Texas.

OIL INDUSTRY PRINTING

OIL FIELD LEGAL BLANKS
Leases, assignments, releases, township plat books, well records, etc. Request on your letterhead gets free catalog. Olds Press, 215 East Third St., Tulsa, Okla.

HOTELS

NEW BRADY HOTEL, TULSA, OKLA.
Tom Wilson, Mgr.
Fireproof, remodeled, new management. Free parking. Prompt, courteous service. Rates $1.00 up. Private baths $1.50.

LEASES—PRODUCTION

GREASEWOOD, Colorado, leases for sale. Good block leases for well and small bonus. Box 127, Orchard, Colo.

FOR SALE—Wonderful Lease, 360 acres, Alexander Deussen's anticline, oil and gas territory; sell all or half interest, terms. John Sigmund, Corpus Christi, Texas.

FOR SALE—2500 acres Gas and Oil Leases in proven Kansas field at Real Bargain Price. Must have quick action. Address Box E-800, The Oil and Gas Journal, Tulsa, Okla.

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Chicago Spot Market Is Back to Life

Refiners Behind on Gasoline Shipments and Quantity Available in Open Market So Low the Seller Can Name His Price

By Robert C. Conine
Chicago Bureau, The Oil and Gas Journal, 6 North Michigan Ave.

CHICAGO, Nov. 9.—Events are conspiring to put the oil men in a much better frame of mind during the annual meeting here November 10-12, of the American Petroleum Institute, than was the case at the St. Louis sessions of the institute when the problem of overproduction was at its worst, and the marketing branch of the business was momentarily in chaos because of the introduction of a third grade of gasoline by a major interest to meet price cutting competition.

For three days now wells in East Texas have been operating under an allowable production of 125 bbls. each, a decrease from 150 bbls. earlier in the week, which was a reduction from the 185 bbls. per well decreed at the time the complete martial law shutdown was lifted. And Gov. Ross Sterling of Texas can be sure that he will be believed when he says that he will continue to beat down production as rapidly as new wells are brought in. In Oklahoma sentiment for curtailment is much the same and the industry is learning that "it can be done."

In the matter of crude runs to stills information is highly favorable and it is significant that there has been a marked decline in offerings of gasoline by refiners. There are reports that a little more low gravity fuel oil than is desirbale is coming into Chicago district, but in the matter of gasoline the marketers are certain that the reverse is quite true. Refiners, so it is said in all quarters, are far behind on their shipments and the quantity of motor fuel readily available on the open market is such that the seller can name his price and stick to it regardless of the buyer's contention that the seller is "way out of line."

Spot Market Active

The 1-cent advance in the tank wagon and service station gasoline markets throughout its entire territory of 10 north central states by Standard Oil Co. of Indiana, effective November 6, applicable also on naphtha tank wagon prices, has brought the gasoline spot markets back to life and moved tank car prices up. One of the major interests reports a 75 per cent increase in spot business immediately following the advance. Eighty-five to 90 per cent of the business done by another company is now on the open market, although a little more than a week ago the contract orders featured.

Gasoline resellers and distributors, it is indicated, have allowed their stocks to become unusually low and are now actively engaged in obtaining supplies before further prices advances are registered. Rush orders for as much as seven cars, or 112,000 gallons, at 4⅜ cents to 4½ cents have been received from distributors in Chicago.

See Tank Wagon and Station Advance

Looking over the spot market quotations for the first part of this week we find that prices, which have moved up slowly in steps of an eighth of a cent for the past four weeks, have reacted as follows to the 1-cent tank wagon and service station boost inaugurated by Standard Oil Co. of Indiana and followed immediately by the other companies in the territory: U. S. Motor gasoline of no octane specifications moved from a range of 4⅛ to 4¼ cents to a range of 4½ to 4¾ cents; the 60-62 gravity 400 endpoint gasoline advanced from a range of 4¼ to 4⅝ cents to a range of 4¾ to 5 cents; the 64-66 gravity 375 endpoint material advanced from a range of 4¾ to 5 cents to a new range of 5 to 5⅛ cents, and the 68-70 gravity 360 endpoint gasoline has moved up from a range of 5⅛ to 5¼ cents to a new range of 5¼ to 5½ cents. Blended gasoline of 64-66 gravity and 437 endpoint has advanced from 4 to 4½ cents. The price on the natural gasoline blend is nominal, however, as there is practically no gasoline of this type on the open market in Chicago district.

Another Advance in Prospect

These are the markets in the Chicago district, basis Group 3, three days after the 1-cent tank wagon and service station advance throughout the territory. After today, Monday, the price structure is expected to change materially and another tank wagon and service station advance of 1 cent will be in order, if not certain. In the following will be discussed the factors which are considered to be operating for still stronger gasoline markets in the territory.

Marketers in Chicago district have been watching the eastern refinery markets closely since prices started their advance in this territory, and the announcement that effective today marketers operating in Ohio are moving up their gasoline tank wagon and service station prices 1 cent is hailed as good news for the Mid-Continent refiners. To make the situation clearer:

Distributors in Chicago district have been doing an interesting business with Pennsylvania gasoline. This material is rate at 50 benzol equivalent, or about 64 octane number, is 60-62 gravity and has a 410 endpoint. The cost to the distributor, f.o.b. Pennsylvania refinery, is 4.5 cents. Selling this material in Kalamazoo, the Chicago distributor pays out 1.92 cents per gallon freight, making the price 6.42 cents delivered, and then deducting the Group 3 rate of 3.43 cents Kalamazoo, the cost of the material to the distributor is brought down to 2.99 cents so that it can be sold at 3.5 cents Group 3, at a half-cent profit. The price to the distributor for shipment into Detroit is even less: Cost at Pennsylvania refinery, 4.5 cents; freight, 1.65 cents; total, 6.15 cents; deducting Group 3 freight rate, 3.7 cents, making a price of 2.45 cents. Moving down to Indianapolis, where gasoline had been moved from Louisville, we find that Pennsylvania gasoline can be delivered there at a cost of 3.6 cents to the distributor as follows: Cost of gasoline at refinery (Pennsylvania), 4.5 cents; freight, 1.81 cents; total, 6.31 cents; Group 3 freight rate, 2.71 cents; leaving 3.60 cents as cost. The cost of material shipped from Louisville figures as follows: Cost, 5.5 cents; freight, 1.32 cents; minus Group 3 freight, of 2.71 cents; leaves a cost of 4.11 cents. This type of superdistribution is expected to lose its appeal with the additional strength which is coming into the eastern markets and the Mid-Continent refiners who are having their troubles now have reason to feel easier.

Crude Advance Held Necessary

However, all of the indications and a consideration of the modus operandi of the recent tank wagon and service station advance, point to an advance in crude oil markets as the signal for the expected gasoline tank wagon and service station price increase. In fact, it is practically understood in Chicago district oil trade circles that crude oil prices must be boosted again before the gasoline markets reach a position which is really favorable in the territory. There is little discussion as yet upon the action of Rumanian oil producers in endorsing a world-wide curtailment program, but naturally the effect is on the constructive side. It may be mentioned here that Detroit, where Rumanian gasoline has been imported to carry on price competition, was the only spot in the teritory where the 1-cent tank wagon and service station price advance did not go into effect.

Working along with an unusually large number, for the oil industry, of constructive factors is the weather. That is, in respect to the gasoline markets. A stranger in Chicago does not properly appreciate the present efforts of the weatherman to palliate the woes of the industry, and it is the Chicago conditioned marketer who is still marvelling at days in October and November in the Chicago district in which one can take the automobile out for a pleasure drive. That Chicagoans are still very much automobile minded is reflected in the continued high level of demand for gasoline.

One thing is certain and that is that marketers have never before heard so much about octane numbers as in the past four weeks, and along with this has been revived the more or less discredited appeal of high gravity regardless. At the trackage stations where octane specifications are not displayed the gravities figure prominently on placards and the operators have vague sounding speeches to offer in regard to the antiknock value of their gasolines. The 9-cent gasoline has 60-62 gravity, and the 12-cent premium grade is credited with 66-70 gravity. The prices do not include 3-cent state tax. The premium grade, according to the trackage station attendant, is the envy of Ethyl sellers and 3 cents cheaper. In the tank car markets the U. S. Motor gasoline of 60 octane number commands from a quarter to three-eighths of a cent above the no octane specifications material.

Second Grade Ethyl Next Year?

Although official information to date discourages the expectation that Ethyl Gasoline Corp. will permit licensees to add tetraethyl lead to their regular grade of gasoline to bring its octane rating up to 70, there is a feeling among refiners in the Chicago district that the viewpoint of the Ethyl Gasoline Corp. will undergo a drastic change about February 1, 1932. Permission to blend an Ethyl gasoline to 70 octane number, it is believed, would have been given before now were it not necessary to place "lead" seals on the regular grade pumps from which gasoline would be sold at 3 cents below the Ethyl premium grade, thus affecting the unique position of the present Ethyl fuel.

Consider, as an example, one type of cracking operation in respect to yield and octane ratings at different operating pressures and temperatures. This cracking unit when operating at 600 pounds pressure and 900° F. temperature, gives a yield of 60 per cent gasoline of 63 octane number with a Mid-Continent crude charging stock. By increasing the temperature to 1,000° F., the pressure constant, this charging stock is made to yield 57 per cent of gasoline of 68-69 octane rating. By boosting the temperature up to 1,050° F., pressure 600 pounds, the octane rating is brought up to 70, and the yield is cut down to 55 per cent gasoline.

It is the experience of one refiner that a 61 octane number gasoline requires the addition of the full 3 c.c.'s of tetraethyl lead to bring the octane rating to 74, while the addition of the same amount of tetraethyl lead to the 68 octane number gasoline is required to obtain 78 octane number gasoline. This refiner points out that the different gasolines, those processed differently or those from different charging stocks, vary in their susceptibility to tetraethyl lead.

Straightrun Gasoline Problem

Now comes the problem of what to do with the straightrun gasoline which is apparently being moved entirely out of the picture and which is finding less solution in the outlet provided by the introduction of the third grade motor fuel. With the constant improvement taking place in respect to antiknock rating in gasolines, more and more straightrun gasoline of octane ratings varying from 52 to 60 is left on the hands of the refiner. The answer to the problem, according to most of the technologists in the district, is reforming of the straightrun gasoline. This gasoline, perhaps taking a wider cut than heretofore must be run to the cracking units. The yield from this charging stock is from 70 per cent to 80 per cent of 68-69 octane number gasoline. Cracking of straightrun gasoline (naphthas) at higher pressures and lower temperatures than those outlined above, is described in the April 30, 1931, issue of The Oil and Gas Journal, page 16.

With Ethyl premium gasoline having an octane rating of 78 after March of next year, it is practically certain that the white stock for the premium grade must have an octane rating of at least 66, in the case of the refiner mentioned above, to keep within the 3 c.c.'s requirement. In the same issue of The Oil and Gas Journal mentioned, page 22, the technologists have presented the relationship between octane number and tetraethyl lead requirement. This curve shows a pronounced decrement in requirement as the higher octane numbers are reached, and the refiner is assured that his extension in cracking operations will be rewarded by savings in Ethyl fluid aside from the "gallonage charge" cut made by Ethyl Gasoline Corp. from 0.5 cent to 0.425 cent. When the problem will be demanding an answer much more strongly than at present will be upon the return of warm weather when the necessity for better antiknock quality is more in evidence.

Expanding Cracking Facilities

Another refiner in Chicago district has launched a building program to expand cracking facilities at tis plant and replace obsolete pressure equipment. According to the announcement Saturday of this company, not less than $1,000,000 will be invested within the next two months in the addition of cracking units. It has been indicated that considerable attention has been given at this refinery to the cracking of naphtha for a high yield of approximately 70 octane number gasoline. It is also to be pointed out that among the refiners in the district vacuum pressure distillate rerun units are gaining in popularity for the production of a more gum and color stable gasoline. No complaints have been heard on gum trouble following the move to boost octane ratings, but there has been some criticism in regard to odor of some gasolines.

Naphtha tank wagon markets were advanced 1 cent in the territory November 6, when the gasoline market increase was made. The naphtha tank car markets had not been advanced Monday, however. The new tank wagon postings are: Oleum spirits, 11.7 cents; V.M.P. naphtha, 13.7 cents; cleaners' naphtha, 15.2 cents, and Stanisol, 15.2 cents. The tank car markets remained as follows: Oleum spirits, 6 cents; V.M.P., 7.5 cents; cleaners' naphtha, 9 cents; Stanisol, 9 cents. It is reported among technologists in the district that various refiners are turning more attention to the manufacture of special naphthas and solvents. One refiner is said to have carried out

(Continued on Page 100)

Gasoline and Kerosene Advance in East

General Refined Products Market Firmer, Reflecting Crude Oil Increase, and Cold Weather Stimulates Furnace Oil Business

By A. E. Mockler
New York Bureau, The Oil and Gas Journal

NEW YORK, Nov. 9.—Developments in East Coast refined products markets were along decidedly constructive lines during the last week and market sentiment appeared to have registered a notable change for the better. Strengthening in the Mid-Continent crude oil market, together with improvment in the statistical position of refined oil markets generally, was reflected in advances of one-half cent per gallon in refinery quotations for both gasoline and kerosene in this area.

The mark-up in kerosene was initiated by Sinclair Refining, which announced the advance November 5, effective the following day, on which date other companies followed with similar action. The upward movement in U. S. Motor gasoline was started by Tide Water on November 6, with other refiners following.

The only recession in eastern markets during the week occurred in the cylinder oil market where the momentum of recent sharp price advances failed to hold, and the market eased off materially on all specifications. The advance in cylinder oil prices, however, had been out of all proportions to changes in crude oil quotations recently, and some reaction had been looked for as prices reached levels sufficiently attractive to develop price cutting on competitive sales.

Local trade circles were stirred by a report indicating that a shipment of 1,500,000 to 3,000,000 gallons of Rumanian gasoline was en route to New York, consigned to an independent marketer here. Details concerning the reported shipment could not be confirmed.

The outlook for a world accord on crude petroleum production was materially improved by announcement that the Association of Rumanian Oil Producers, taking in all of the principal producing interests in that country, had endorsed the suggestion for a world agreement to balance production and consumption of petroleum in an effort to stabilize the world oil position. An early world conference, taking in all of the important producing interests with the exception of Russia, is looked for to further the plan.

Refinery Gasoline

An advance of one-half cent per gallon in the quotation for U. S. Motor gasoline featured the refinery gasoline market in the East during the week, the advance starting on November 6 with Tide Water increasing its posted price to 6 cents per gallon in tank car lots. The market is not yet on a firm 6 cents level, a few sellers still quoting 5½ cents per gallon, but it is expected that the general situation will firm up early this week, with no motor fuel of 65 octane number or better available under the 6 cents level. Marketers whose product does not come up to the 65 octane number rating, it is expected, will be compelled to take a quarter to a half cent under the prevailing market for the higher antiknock rating fuel.

There was a good demand for gasoline throughout the week, weather conditions continuing favorable. While the East experienced its first real cold snap during the week, the weather was clear and consumption of gasoline by motorists was well maintained.

A large shipment of Rumanian gasoline is reported afloat for New York, consigned to an independent marketer here. The report could not be concerned, and it was considered possible that the shipment in question may represent additional deliveries to the Detroit marketer who some weeks ago received a large cargo of the Rumanian motor fuel. The tanker moving the current shipment was chartered for "U. S. Atlantic port North of Hatteras or Montreal."

Eastern marketers, who recently contracted for several million gallons of California gasoline for delivery over the closing quarter of the year, were in the market this week for gasoline for shipment out of the Gulf. One large buyer was inquiring for a large cargo, for prompt shipment, but was unable to locate gasoline of 65 octane number or better under 4½ cents per gallon, f.o.b. Gulf port. This price is a quarter to a half cent per gallon over buyers' views, but Gulf sellers are apparently a unit in quoting 4½ cents as their minimum price for this grade.

Tank Wagon Gasoline

There were no general revisions in gasoline tank wagon quotations in this territory during the week. Gallonage was well sustained, and it was reported that October volume in many instances had run well ahead of that for the comparable month in 1930.

It is not expected that the current advance in the refinery quotation for gasoline will be immediately reflected in retail markets. The principal effect of the mark-up, it is believed, will be to stiffen retail markets in some sections of the territory where a weakening tendency has been noted lately. In the metropolitan area, where posted prices have been closely adhered to for some weeks past, price cutting has again cropped up, with prominent brands retailing at 8 gallons for $1, including tax.

Colder weather has stimulated demand for premium gasolines, and has brought about more insistence by jobbers on deliveries of motor fuel testing a minimum of 65 octane number on tank car shipments of U. S. Motor gasoline. Thus far, eastern refiners are not, as a class, differentiating between 65 octane number or lower grades in their deliveries of U. S. Motor gasoline, although there are increasing evidences that action along this line will be forced shortly.

Kerosene

Improvement in the statistical position of the kerosene market, coupled with a sharp increase in consumption resultant from the colder weather throughout the East, brought about a sharply improved tone in the kerosene market last week, and principal sellers advanced quotations for 41-43 water white in tank car lots a half cent to 5½ cents per gallon, f.o.b. refinery terminals. Demand was not adversely affected by the increase, and gallonage continued heavy.

Tank wagon sales of kerosene showed a sharp gain during the week, and the market was in steadier position. No price changes followed the advance in refinery quotations, and it is not expected that the retail kerosene market will be affected, from the price standpoint, until the refinery basis shows further strengthening.

Lubs

Increased competition on spot sales among refiners, coupled with the lower market for Pennsylvania crude oil, brought about a sharp recession in cylinder oil prices during the week, and prices were lower all along the line. Demand had eased off somewhat, and refiners, who have experienced a sensational upward movement in selling prices during the past six weeks, were showing more disposition to grant recessions on spot business.

Revised quotations, which are a cent a gallon or more under previously existing levels, follow: 600 steam refined, 21 to 22 cents per gallon; 635 steam refined, 22½ to 23 cents; 650 steam refined, 24 to 24½ cents; 600 Pennsylvania flash, 25 to 26 cents; 630 Pennsylvania flash, 28 to 29 cents; 600 Warren E, 24 to 24½ cents per gallon; 600 Oil City E, 23 to 23½ cents; bright stocks, light, 32 to 33 cents; bright stocks, dark, 31 to 32 cents per gallon, all in barrels, f.o.b. local terminals.

There were no changes recorded in the market for pale and red oils during the week, and gallonage was reported fairly well maintained.

Furnace Oil

A sudden cold snap at the close of the week brought about a heavy demand for furnace oil, and shipments showed a sharp increase, both in refinery and tank wagon markets.

The refinery market for domestic heating oil, minimum 32 gravity, holds at 3½ cents per gallon, in tank car lots, and a stronger undertone has developed in the market, reflecting the more bullish feeling in other refinery centers. Tank wagon quotations are steady and unchanged.

Fuel Oil

The mark-up in crude oil quotations in the Mid-Continent area has brought about a better feeling in the fuel oil market, but the posted price for bunker "C" holds unchanged at 60 cents per barrel, in bulk, f.o.b. refinery terminals. Demand has been well maintained.

The most encouraging development with respect to the fuel oils, refiners here declare, is the news from Paris indicating approval of a world pact for the limitation of crude output, expressed by the association of Rumanian producers. Rumanian competition in European markets has been largely instrumental in driving local bunker and Diesel oil prices to record low levels.

Diesel Oil

Routine activity was reported locally throughout the week, with refiners continuing to quote the market at $1.30 per barrel, bulk, f.o.b. refinery terminals.

Improvement in the domestic market situation, with indications of a better statistical position in other parts of the world, has given traders in the Diesel oil market a more optimistic outlook.

Gas Oil

While market sentiment was somewhat better during the week, there were no price changes recorded during the period, and refiners continue to offer oil of 28 gravity plus at 4 cents per gallon in tank car lots, f.o.b. refinery terminals. There has been a better demand from gas manufacturing companies in this area, and spot business has also showed a little increase. Industrial consumers have been stocking ahead in fair volume, evidently anticipating a stronger market by the close of the year.

Wax

No further price changes developed in the paraffin wax situation during the week, and business continued along routine lines.

An easy undertone continues on fully refined, and it is reported that considerable quantities have been moved into export channels during the past fortnight at concessions from quoted levels.

Export Market

A part cargo of 3,000 gallons of 64-66 naphtha was reported sold at the Gulf during the week, for prompt loading. The price at which the business was closed was not announced, the contract having been booked c.i.f. Rouen.

The gasoline export market at the Gulf has stiffened in sympathy with domestic markets, sellers quoting U. S. Motor at 3⅞ to 4 cents per gallon, 60-62, 400 endpoint, at 4⅛ cents, 61-63, 390 endpoint, at 4¼ cents, and 64-66, 375 endpoint, at 4½ cents per gallon. Water white kerosene is unchanged at 3¾ cents, with prime offered at 3½ cents per gallon.

The export situation has assumed a brighter hue on reports of pending Rumanian co-operation in a world curtailment measure, and exporters are looking for some revival in the demand for refined products out of the Gulf in 1932. However, there is a long road between planned curtailment and actual action along these lines, and large integrated companies are still inclined to view the outlook for the export market with a considerable degree of pessimism.

Petroleum Exports

Substantial improvement in export movement of refined petroleum products was reported locally during the past week, shipments of paraffin wax in particular registering sharp gains.

The following table shows principal exports of refined petroleum products from the port of New York for the past three weeks (all figures in gallons unless otherwise noted):

	Week ended		
	Oct. 31	Oct. 24	Oct. 17
Gasoline	70,000	305,000	445,000
Naphtha	880,000	160,000	60,000
Kerosene	22,000	43,000	6,000
Fuel oil	330,000	43,000	65,000
Lubricating oil	1,245,000	981,000	500,000
Petroleum, refined	1,502,000	1,245,000	1,080,000
	Pounds		
Petrolatum	35,000		
Paraffin wax	5,340,000	770,000	490,000
Refined	260,000	223,000	615,000
Scale	320,000	150,000	110,000
Lubricating grease	1,130,000	1,001,000	350,000

A number of heavy paraffin wax shipments were reported cleared, including 1,700,000 pounds on the Habana for Gijon, 490,000 pounds on the Excambion for Naples, 630,000 pounds on the Columbia for Barcelona, 250,000 pounds on the Hans Arpe for London, and 913,000 pounds on the Habana for Salamanca.

The increased export movement in refined products is attributed largely to shipments by the large integrated companies to their foreign marketing subsidiaries, as the open market recently has not reflected any substantial gain in activity.

Imports

Imports of crude and refined petroleum at the principal United States ports for the week ended October 31 totaled 1,986,000 bbls., a daily average of 283,714 bbls., compared with 1,204,000 bbls., a daily average of 172,000 bbls. for the previous week and a daily average of 241,357 bbls. for the four weeks ended October 31. Details follow:

(Barrels of 42 Gallons)	
At Atlantic Coast Ports—	
Baltimore	423,000
Boston	200,000
New York	857,000
Philadelphia	148,000
Others	243,000
Total	1,871,000
Daily average	267,285
At Gulf Coast Ports—	
Galveston district	64,000
New Orleans and Baton Rouge	51,000
Total	115,000
Daily average	16,429
At all United States Ports—	
Total	1,986,000
Daily average	283,714
Daily average four weeks	241,357

Distribution of total imports is as follows:

Crude	808,000
Gasoline	271,000
Fuel oil	907,000

A second large shipment of Rumanian gasoline is now afloat for the United States, and its arrival will be reflected in import figures shortly. The shipment is expected to reach Detroit, via Montreal, although it is understood that the tanker

moving the gasoline was chartered for delivery either to Montreal or to a United States Atlantic port north of Hatteras, indicating the possibility of delivery of this motor fuel to a market in East Coast territory.

California Oil Receipts

Receipts of California crude and refined petroleum at Atlantic and Gulf ports during the week ended October 31 totaled 97,000 bbls., a daily average of 13,857 bbls., compared with 146,000 bbls., a daily average of 20,857 bbls. for the previous week and a daily average of 40,214 bbls. for the four weeks ended October 31. Details follow:

((Barrels of 42 Gallons)

At Atlantic Coast Ports—	
New York	97,000
Total	97,000
Daily average	13,857
At Gulf Coast Ports—	
All ports	none
At Atlantic and Gulf Coast Ports—	
Total	97,000
Daily average	13,857
Daily average four weeks	40,214

All of the week's arrivals of California petroleum were gasoline.

Shipments of refined products from California for Atlantic and Gulf Coast ports during the week, with identity of owner of tanker moving the oil where such owner is an oil company, follow:

For New York—90,000 bbls. of gasoline on the Livingston Roe (Standard Oil Co. of New Jersey); 129,800 bbls. of gasoline on the Tamiahua (Richfield); and 93,300 bbls. of Diesel oil on the India Arrow (Standard Oil Co. of New York).

For Port Arthur, Tex.—72,400 bbls. of gasoline on the Illinois (The Texas Company).

Charter Market

A substantial movement of Venezuelan crude to the Teneriffe refinery, which supplies the Spanish Petroleum Monopoly with part of its refined products requirements, is indicated by the chartering last week of a large motorship for 24 consecutive voyages from Aruba to Teneriffe, shipments to commence next month. The shipments are expected to comprise the royalty oil derived from a Spanish company with important holdings in Venezuela.

There was but a routine amount of business reported in the tanker charter market during the past week, with most of the business being done abroad.

Fixtures reported during the week were as follows:

Motorship, 9,000 tons, crude, Aruba to Teneriffe, 24 consecutive voyages, 6/3, beginning December.

Steamer Winneton (German), 3,055 net, lubricating oil, Gulf to London, Liverpool and Havre, p.t., January.

Steamer, clean, Constanza to two ports, U.K./Continent, 8/3, December loading.

CHICAGO SPOT MARKET IS BACK TO LIFE

(Continued from Page 98)

an arrangement for close fractionation of the naphtha cuts to provide chemically pure rubber solvents which are unapproached elsewhere. Instead of using a single high fractionating column this refiner is using banks of three smaller towers for more complete division of the cuts. This plant is located in Oklahoma.

Standard's New Dump Discount

Effective November 4, Standard Oil Co. of Indiana started a new dump discount applicable on all grades of gasoline sold from tank wagon. From that date customers buying 25 gallons or more of gasoline at one time will be given 1 cent per gallon discount off tank wagon price at time of delivery, and this is the only discount available to customers not under contract. Customers holding quantity discount contracts or other contracts which call for payment of an allowance at the end of the month will now receive 1 cent discount at time of delivery and the balance of the discount at the end of the month. Customers holding resellers contracts, and agreements of that type, will receive the same discount as in the past, and will receive the discount at time of delivery. It is to be noted, the announcement states, that the discount to contract customers is not increased and that actually the new dump discount of 1 cent per gallon on deliveries of 25 gallons or more results in a benefit only to tank wagon customers who have been unable to qualify for one of the other contracts in use.

Kerosene markets advanced with the upward movement of the heavier distillates and in response to information that export business is reviving.

Fuel oils and gas oils, in spite of failure of cold weather to materialize in the district and the low industrial demand, have advanced strongly in price. Prices quoted Monday were: 18-22 fuel oil, per barrel, 32½ to 37½ cents; 22-26 fuel oil, per barrel, 37½ to 42½ cents; 28-30 fuel oil, zero, per barrel, 52½ to 57½ cents: 32-36 industrial gas oil, 1⅝ to 1¾ cents; 32-36 zero gas oil, 1¾ to 2 cents; 38-40 straw distillate, 1⅞ to 2⅛ cents.

KANSAS FIELDS

(Continued from Page 55)

Section 21-19-1w, has been completed for 19,900,000 feet of gas in chat 2,908-71 feet.

Reno County

Shell Petroleum Corp. and Continental Oil Co.'s No. 1 Blake, SW cor. SE SE, Section 23-23-4w, is preparing to deepen from 3,308 feet.

Rush County

Schlegel, Skelton and others made location for No. 1 Harman, C NW, Section 4-18-16w. Flynn and others made location for No. 1 Witesman, C NE, Section 16-18-16w.

Sedgwick County

Roy Ramsey's No. 2 Davies, SW cor., Section 17-27-2, is spudding. Seigel Brothers' No. 1 Soukup, SE cor. NE NW NE, Section 19-27-2, is rigging up to drill deeper. Fisher & Lauck's No. 9 Trustee, SE cor. NW SE, Section 19-27-2, Eastborough Pool, is spudding. Derby Oil Co.'s No. 1 Eastborough, SE cor. SW NE, Section 19-27-2, is preparing to deepen from 2,961 feet. No. 7 Eastborough, NE cor. SW NE, Section 19-27-2, is spudding. Derby Oil Co.'s No. 5 Eastborough, NE cor. SW NE, Section 19-27-2, has been completed for 70 bbls. at 2,971 feet after plugging back from 3,194 feet.

OKLAHOMA FIELDS

(Continued from Page 54)

Field continued at a high level during the last week ending November 7, when the field averaged 189,300 bbls. daily. During the week two new producers were added to the field, bringing the total to 844 wells. Several new locations were announced but work has not as yet started.

Due to several changes in the umpire's force new potential figures were delayed. Beginning Saturday, November 7, the umpire's force will take a maximum of 50 wells a day, since it was found that the schedule of 75 a day would tax the field employes and delay the situation.

Town Lot Drilling Restricted

In an attempt to extend the U-7 drilling zone in Oklahoma City to include the NE of Section 16-11-3w, which includes the Oliver Park Addition and the city-owned Oliver Park of 35 acres, the city commission denied the petition. The petition was presented by M. Duffy after he had leased considerable acreage in that neighborhood, believing the territory would produce oil.

The commissioners advised that oil development in that part of the city would create a hazard in the Capitol Hill district. There are few improvements in the city-owned park, but the district is closely built with residences.

The attempt to extend the drilling zone indicates that the leasing of acreage on the west side of the field has extended a considerable distance. Acreage has been leased in Sections 9 and 21-11-3w, and practically all of Section 22-11-3w is leased and several tests are drilling in that section.

Carter Leases Town Lots

Carter Oil Co. is straightening up titles on the northwest edge of the city field. Leases filed of record include Lots 13 and 14 of Block 1, Artesian Heights, and Lots 13 to 18 of Block 1, Argood Addition; on Lots 17 and 18 of Block 5; Lots 21 to 24 of Block 3; Lots 35 and 36, Block 6; Lots 34 and 35, Block 7; Lots 12 to 29, Block 7; Lots 2, 4 and 5, Block 8; Lots 1 to 3 and 8, 9, 15 to 24 and 36 to 40 of Block 7; Lots 2 to 4 and 18 to 24 in Block 8, all in Lake View Addition. The Carter Oil Co. has also leased E half SW and SW SW, Section 12-12-4w.

During the last week considerable acreage and trading of lots has been in progress in the residential section of the Capitol Hill Addition on the north and west sides of the Oklahoma City Field. Some of the leasing has been outside of the U-7 drilling zone.

Skelly Oil Co. has leased the acreage in Lots 8 and 13, Carney Heights Addition. L. J. Simmons has leased acreage in the W half SE, Section 34-11-3w.

Greater Seminole's Potential

Many express the opinion that the Greater Seminole area will approximately make its potential of 300,000 bbls. a day which has been estimated by Ray M. Collins, the state umpire. The estimate of 300,000 bbls. a day for the entire area is indicated by the gauging of some of the wells in the fields during the last week.

It will be around the end of the month before the exact gauges are obtainable from the Greater Seminole area. About 2,700 wells are to be tested and only a few have been gauged. On the basis of a 300,000-bbl. a day potential, Greater Seminole is to be given an allowable of 155,000 bbls. a day.

Daily gauges for the first four days in the Allen and Sasakwa Pools, and for two days in the Earlsboro and Earlsboro Townsite Pools have been completed and they are as follows: Allen Pool, first day, 21,814 bbls.; second day, 20,001 bbls.; third day, 18,647 bbls.; fourth day, 18,068 bbls. Sasakwa Pool, first day, 2,858 bbls.; second day, 2,648 bbls.; third day, 3,255 bbls.; fourth day, 2,781 bbls. Earlsboro Pool, first day, 22,743 bbls.; second day, 23,403 bbls. Earlsboro Townsite, first day, 2,635 bbls.; second day, 3,879 bbls.

Wildcat Stimulates Leasing

The wildcat test in Section 2-6-4, in the Sacred Heart area of Pottawatomie County has stimulated the leasing of acreage in that area. The Amerada Petroleum Corp. is reported to have paid high for 60 acres in the NE, Section 2-6-4, including 20 acres from The Texas Company for which $450 an acre was reported to have been paid. George Burgher has assembled a block of acreage in Section 31-7-5. Gypsy Oil Co. has leased the SW NE, Section 30-9-4, and NW SW, Section 18-9-4. Mid-Continent Petroleum Corp. has leased the W half SE, Section 31-7-5. The Prairie Oil & Gas Co. has leased the SW NE, Section 14-11-5. The Ohio Fuel Supply Co. has assigned the Continental Oil Co. the SE SE, Section 18-7-4. The Gypsy Oil Co. leased the SW NW, Section 5-8-5, N half N half SW, Section 9-9-4, and S half SE, Section 6-7-4.

In the extreme north end of Seminole County a leasing campaign has been in progress as the result of the recent geological survey of the area. The Tidal Oil Co. has purchased the N half NE, Section 35-11-5; Prairie Oil & Gas Co. the E half NW, Section 35-11-5, and SW NW, Section 25-11-5; Gypsy Oil Co. the E half SW SW and SE SW, Section 18-10-6. There has been some scattered buying of acreage in Pontotoc County and in the extreme south end of Seminole County.

Pontotoc County is getting some new developments outside of the Beebe Field. Barnsdall Oil Co.'s No. 1 Hart, NW cor., Section 25-5-6, is spudding. Indian Territory Illuminating Oil Co. is a small block of acreage in Section 35-5-4, which may be developed later.

In the Southern Fields

The territory surrounding the townsite of Loco in Stephens County is expected to be tested for oil and gas in the shallow pay horizon and there are prospects of deeper tests being made during the next few months. Part of the townsite has been leased in the new campaign. Lee Morrison and others' No. 1 in Section 15-3s-5w is drilling at 600 feet and is expected to reach the gas sand in a few days.

C. Miller and others' No. 1, SW cor., Section 35-2s-5w, is a new location for a 2,000-foot test. E. L. May has leased the SE NE SE, Section 27-2s-5w; E. L. Robertson, the S half SW SW and NW SW SE and W half NE SW, Section 28-2s-5w and the northwest 10 acres of Lot 4 and part of the Loco Townsite in Section 1-3s-5w.

Other new work in Stephens County includes Cohen & Randall's No. 1, SE cor. SW SW, Section 35-2s-9w, which offsets another test which has been abandoned, but had approximately 12,000,000 feet of gas at 1,800 feet. The company has leased acreage along the Stephens-Comanche County boundary lines and in Section 35-2-9w.

Creek County

Gled Oil Co. has a machine on the location for No. 4 Travis, SE cor. NE, Section 13-19-8. A. A. Bailey and others' No. 4 Weaver, SW cor. NW, Section 18-19-9 is rigging up. Ben Curtis and others' No. 1-A Reynolds, SW cor. SE, Section 29-17-12, is a machine rigging up. Gled Oil Co.'s No. 3 Travis, NE cor. SE SE NE, Section 13-19-8, has been completed for 175 bbls. in sand 2,239-80 feet. No. 1 Holmes, NE cor. SE NE, Section 25-19-8, is dry and abandoned at 3,085 feet. Bryan Petroleum Co.'s No. 1-A Bucktrot, SW cor. SE NW NW, Section 35-17-10, has been completed for 2,500,000 feet of gas in sand 1,675-85 feet.

Hughes County

Gypsy Oil Co. made location for No. 2 McNevins, NE cor. SW, Section 5-8-9. Mid-Continent Petroleum Corp. has staked location for No. 1 Bruner, NE cor. NW SE, Section 9-7-8. Iglehart and others' No. 1 McCoy, SE cor. NW, Section 27-9-10, has been completed for 25 bbls. in sand 2,313-50 feet, total depth 2,356 feet.

Jefferson County

O. V. Beck's No. 2 Clyde Seay, SE cor. SW NW SE, Section 34-6s-5w, is drilling at 1,106 feet. No. 1 Clyde Seay, SW cor. NW SE, Section 34-6s-5w, has been completed for 124 bbls., producing from sands 1,530-45 feet and 1,551-52 feet.

Le Flore County

H. E. Dowd's No. 1 Thomas, SE cor. NE, Section 17-3-22, lost the hole at 1,112 feet and has been abandoned.

Marshall County

M. A. Neff and others moved a machine in for No. 1 West Rutland, SW cor. NW NW SE, Section 30-5s-6.

Muskogee County

J. Aggas' No. 1-A J. Rowe, NE cor. SE NE, Section 28-16-15, is drilling at 1,340 feet. C. D. Bradley and others' No. 1 F. Jacobs, NE cor. SW, Section 7-15-17, is a machine. H. W. Guinan's No. 1-A Lewis, NW cor. SE, Section 8-14-17, is drilling at 60 feet. E. Pine's No. 1-A James, CNL NW NE, Section 19-14-17, is drilling at 400 feet. W. J. Metzger's No. 10 L. Francis, SE cor. SW NE SW, Section 1-14-18, is an old well drilling deeper at 1,500 feet. J. M. Foltz and others' No. 1 G. Island, SW cor. NE, Section 8-15-18, has been completed for 10,998,000 feet of gas in sand 1,590-97 feet.

Oklahoma County

T. B. Slick estate made location for No. 8 Classen-Edwards, NW cor. SW NW SW, Section 3-11-3w, Oklahoma City Pool. Hudspeth Drilling Co. and Giles' No. 1 Fish, Block 4, Earpe Acreton Addition, SE cor. NE SE SE, Section 22-11-3w, is a cellar. Phillips Petroleum Co.'s No. 1 Chapin-Levi, SE cor. NE NW NW, Section 10-11-3w, has been completed for 5,922 bbls. in four hours on a 4-inch choke, producing from sand 6,319-6,500 feet. Argood and others' No. 1 Catalina, SE cor. NW SE SE, Section 15-11-3w, has been completed for 160 bbls. by heads from sand 6,443-6,552 feet. Standish, McClunty and Wade's No. 1 Hinkle, NW cor. NE SW, Section 27-11-3w, has been abandoned at 300 feet.

Okfuskee County

Shepard and others' No. 1 Shepard, SE cor. NW SW, Section 3-12-10, is dry and abandoned at 3,710 feet.

Okmulgee County

Shelden & Staples' No. 6 Shelton, NW

cor. SW SE, Section 15-13-12, has been abandoned at 1,972 feet. Henley and others' No. 1-A B. Lee, NW cor. NE SW, Section 26-15-12, had sand 1,874-84 feet, plugging back to 1,881 feet and completing for 1,000,000 feet of gas. William Sherry and others' No. 1 Pense, C NW SW, Section 21-16-11, made 2,500,000 feet of gas in sand 1,752-81 feet.

Stephens County

J. C. Chambers and others' No. 1-A M. Dare, SE cor. NW SE, Section 2-2s-8w, has been completed for 40 bbls. in sand 1,356-61 feet.

Tulsa County

A. E. Bradshaw and others' No. 2 Cowans, NW cor. SW SE, Section 7-19-14, is drilling at 300 feet.

Kay County

W. H. Atkinson and Eason Oil Co.'s No. 1 Hayes, SE cor. NE, Section 24-28-3, is a rig moving in.

Pawnee County

P. Adamson, Jr., made location for No. 1-A Peoples, SW cor. NW, Section 3-20-8. Gus Beagle's No. 1 T. W. Duck, CEL NE NE, Section 30-20-10, is a machine. Ark Utility Co.'s No. 2 Nielson, CSL NE SW, Section 27-21-8, has been abandoned at 2,281 feet.

CANADIAN FIELDS

(Continued from Page 66)

ingly wet naphtha gas in the lime; while production from the upper sands has been somewhat better than farther north. Some operators claim the producing structure extends south as far as the Highwood River, which, if correct, would leave room for a considerable extension in this direction.

South Turner Valley

In the Mercury area of South Turner Valley, Miracle Oils' No. 2, LSD 16, Section 5-19-2w5, is drilling in the pokerchip shales on top of the lime at 5,418 feet. This location is on the west side of the structure, being offset on the east by Mercury's No. 1. Miracle Oils' No. 3, LSD 11, Section 4-19-2w5, is drilling close to the Home sands at 4,657 feet.

In the far south, Mar-Jon-Freehold's No. 1, LSD 9, Section 28-18-2w5, is drilling below 2,525 feet and will shortly run casing. Livingston Syndicate's No. 1, LSD 5, Section 34-18-2w5, is reported standing cemented at 2,160 feet.

Central Turner Valley

In the Central Turner Valley area, McLeod Oil Co.'s No. 4, LSD 16, Section 1-20-3w5, is deepening in the lower lime at 5,300 feet. This test, previously carried some 1,400 feet into the lime, encountered a lower producing horizon not previously reached in other Turner Valley wells, from which a fair production has since been taken. It is now being deepened for a further test of the lower lime.

Dome Oils' No. 2, LSD 16, Section 36-19-3w5, following burning of the derrick, has resumed drilling and is making hole below 5,390 feet.

Imperial Drilling

In the South Turner Valley Field, Sterling Pacific Oil Co.'s No. 2, LSD 10, Section 33-18-2w5, is drilling below 5,099 feet and getting close to the lime. This is the deepest test now drilling in the field.

In the border areas, Texas-Imperial's No. 1, LSD 14, Section 22-8-22w4, on the Lethbridge structure, is drilling at 3,848 feet.

Hudson's Bay Test

In the Keho Lake area, southern Alberta, Hudson's Bay Oil & Gas Co.'s No. 1 Keho, LSD 2, Section 17-11-22w4, is preparing to resume drilling after cementing for water shutoff. The test got a strong show of light green crude at the Ellis-Madison contact around 4,920 feet, accompanied by about 750,000 feet of gas, and was drilled about 5 feet into the lime. Cement was run in the 8-inch pipe at 4,917 feet to shut off a small water intrusion from the Sunburst sand before deepening the hole into the Madison and testing production.

Border Fields

On the Milk River structure, Commonwealth Petroleums' No. 1, LSD 9, Section 9-3-15w4, is drilling in the lower Devonian below 5,040 feet. The formation shows shale impregnated with heavy asphaltic oil, with streaks of lime and sand and the drill is working in a hard capping, below which a change in formation, with possible production, is expected.

On the international Reserve Dome, east of Coutts, Mayland Southern's No. 1, LSD 13, Section 4-1-9w4, has pulled back and reset the 10-inch pipe. The test is redrilling below 2,290 feet but still above the old bottom of 2,450 feet. Large gas flows have already been met at 1,890 and 2,180 feet, and the oil objective is placed around 3,000 feet.

On the Twin River structure, Parco-Nordon's No. 1, LSD 16, Section 34-1-20w4, is drilling below 3,538 feet and will shortly run 10-inch casing.

Test in the Foothills

On the Moose Mountain structure, Elbow Oils' No. 1, LSD 11, Section 35-22-5w5, is standing at 3,255 feet after drilling through cement. Delay is due to lack of water, and a water well is being put down. Graystone Consolidated's No. 2 Signal Hill, LSD 9, Section 34-23-5w5, is reported at 4,300 feet and reaming out for 6½-inch tools below 4,000 feet. This is the most northerly and deepest of the three tests in the Moose Mountain-Fisher Creek area west of Calgary. A strong show of oil was met in the upper horizons, and commercial production is thought possible in the Dalhousie sand, before the deep lime horizon is reached.

On Fisher Creek, Cotton Belt Mines' No. 1, LSD 5, Section 21-21-4w5, is drilling below 2,600 feet, with additional small shows of oil and occasional heads of gas. The drill is working in the lower Dalhousie and will continue into the lime.

On the Pincher Creek structure, Weymarn Petroleums' No. 2, LSD 5, Section 7-6-1w5, is reported standing cemented at 3,900 feet.

Red Coulee Test

On the Montana end of the international Red Coulee structure, Askalta Oils' No. 2 Farbo, SW NE Section 2-37-4w, is reported preparing to drill into production.

Gas Test at Brooks

In southern Alberta, Canadian Western Natural Gas, Light, Heat & Power Co.'s No. 2 Brooks has been cemented at 1,200 feet and is being drilled into production. Location is about a half mile east of the center of the town, and the test was put down for gas, which in No. 1 Brooks, drilled some years ago, was encountered between 1,250 and 1,350 feet, in the same horizon in which the Medicine Hat production is secured. Wells in this area are small producers, around 250,000 feet a day; production will be used to supplement the supply for the town. Some years ago a deep hole was drilled in this area by the Canadian Pacific Railway, finishing at 2,795 feet, but the only important production was that from the upper sands.

Wainwright Deep Test

The Wainwright Field in east central Alberta, which has been inactive, may have a deep test. Montreal-Alberta Syndicate's No. 1, LSD 2, Section 15-45-7w4, has been standing at 2,300 feet after failing to get satisfactory production in the Wainwright sand, and the backers of the test are reported planning to continue it as a deep test. Drilling will possibly to be resumed this fall. Most of the Wainwright tests have got gas showings and a small production of heavy crude at a depth slightly below 2,000 feet, but there has been no conclusive test of the underlying formations. Imperial Oil's No. 2 Fabyan, LSD 8, Section 18-45-7w4, was carried to 2,830 feet and finished in the lime without commercial production, but was not carried through the formation.

Viking Gas Field

In preparation for the winter, producing gassers of Northwestern Utilities, Ltd., in the Viking Field were recently tested for pressure and volume, by government and company officials, the party being headed by W. Calder of the Alberta petroleum and natural gas department and Manager Julian Garrett and General Supt. C. H. Spencer of Northwestern Utilities, Ltd. The tests showed the wells to be in a satisfactory condition, ample gas reserves for Edmonton and intermediate points being indicated.

Montana Border Test

On the Montana side of the international boundary, Fulton Syndicate's test in the Milk River Field has resumed after cementing, and is making hole below 2,170 feet.

British Columbia Drilling

In the British Columbia fields, Okanagan Oil & Gas Co.'s No. 1, E half Section 2-26-Osoyoos, is reported below 2,050 feet and drilling in a lime and dark gray shale with showings of gas.

Ontario Drilling

There has recently been considerable drilling in the shallow gas fields of Haldimand County, Ontario, and adjacent areas of the Niagara Peninsula. Near Dunnville, the Niagara Natural Gas Co. has since last May drilled nine wells, all being producers, one ranking among the largest wells ever drilled in this area. Amity Gas Co. is drilling for gas in the same area, and the Ontario County Gas Co. has also done some drilling.

In the Mosa oil field, Middlesex County, Buffalo interests are reported to have secured an interest in the Dominion Petroleum Co. which has been followed by a careful overhauling of the producing properties, resulting in a considerable increase in crude oil production. This field, a short distance north of Glencoe, was opened in 1917 by F. J. Carman and others, the field producing from the same shallow lime horizons as the Petrolia-Enniskillen Field of Lambton County. Production has been maintained on a gradually declining scale since 1917.

Some new drilling activity is forecast in the Bothwell Field, farther west; and in the Wallacetown area of Elgin County, to the south.

Ontario Gasser

In Kent County, Ontario, Olga Oil & Gas Co.'s No. 3, Murphy farm, Lot 19, Concession 8, Raleigh Township, has been shot with 300 quarts. When shut in, it developed a maximum pressure reported at 750 pounds, and on being opened the initial flow was recorded at around 2,500,000 feet, though settled production will be somewhat smaller. The gas has no sulphur content, and traces of high grade crude oil, 47 to 48 gravity, are reported showing. E. P. Rowe, geologist for the Olga company, states the two producers are on the edge of the field, and that further drilling is likely to open a field of considerable importance. Olga's No. 4 is being located a short distance east of No. 3.

ROCKY MOUNTAIN AREA

(Continued from Page 62)

18-28, is shut down at 600 feet for repairs.

Western Drilling Co.'s No. 1 Green, NE cor. NW Section 29-17-29, northeast of the Artesia Pool, is drilling at 710 feet in anhydrite and brown shale. It topped the anhydrite at 250 feet and the salt at 335 feet. The base of the salt was at 635 feet.

Oil Well Drilling Co.'s No. 1 Baker, SE NE NE Secion 21-21-26, Carlsbad area, is shut down at 1,155 feet.

De Baca County

Landowners Oil Co.'s No. 1 McAdoo, SW cor. NE Section 16-1s27, Buffalo Creek, is drilling at 4,625 feet and had a show of oil at 4,613-25 feet in brown shale. Progress has been slow due to cavey ground, having stopped to cement four times. The objective is expected at around 4,885 feet.

Guadalupe County

New Mexico Producing & Refining Co., Ltd.'s No. 1 McMillan, SW cor. Section 24-5s-16, Mesa Leon area, is bottomed at 2,600 feet in the Abo formation (basal member of the red beds) and is lowering 12½-inch to shut off water.

San Juan County

R. C. Oswell's No. 2, NW NW Section 34-20-11w, near Aztec, which last week was reported bailing 1 bbl. per hour of high gravity crude at a total depth of 1,414 feet, showed an increase in gas pressure and started flowing by heads. The heads are coming at intervals of two to three hours and it makes about 2 bbls. at each head. The oil is in the second Farmington sand.

Continental Oil Co.'s No. 24, SW NW SW Section 1-29-19, Rattlesnake Dome, is bottomed at 6,063 feet in hard gray lime and is re-establishing circulation. It is around 600 feet off the objective horison in the Pennsylvanian. Same company's No. 17 Santa Fe, C NE Section 2-29-19, which went off production recently after having made more than 360,000 bbls. from the deep pay, is being deepened and is drilling at 6,793 feet in gray shale and lime. Same company's No. 26, NW SE NE Section 2-29-19, is drilling in light gray shale at 695 feet and is about due for completion.

The Ortega interests' No. 2 Ute, NW NW Section 24-31-16, Westwater, is cleaning out below 2,190 feet.

Kutz Canon Oil & Gas Co.'s No. 1 Day, SW cor. Section 20-28-10, Kutz Canon district, is preparing to resume. The 5$\frac{3}{16}$-inch will be run to shut off water encountered at 3,620 feet. Total depth is 3,635 feet.

WYOMING

Fremont County

Kinney-Coastal Oil Co.'s No. 1 Chatteron-Weeks, C SW NE Section 22-3n-1w, Pilot Butte Field, half a mile northeast of a big gasser completed two years ago in the Muddy sand, appears to be drilling itself in after being reported a completion as a 2,000,000-foot gas well at a total depth of 3,631 feet. It was a small well showing a pressure of only 80 pounds after being shut in for two days. The past week it has been showing an increase in pressure, the gauge registering 560 pounds after being shut in over night. When opened up it showed a pressure of 975 pounds or 250 pounds more than the discovery well. The sand is very hard. The volume of gas has increased slightly.

Uinta County

Park City Oil & Gas Syndicate's No. 1 Christensen, NE cor. Section 6-15-113, Lyman district, is standing with 4¾-inch cemented at 2,725 feet, and the Trans-Western Petroleum Co., Ltd.'s No. 1, C SE Section 6-14-118, Aspen Dome, is shut down at 3,216 feet.

Carbon County

Prairie Oil & Gas Co.'s No. 1 Bunker Hill, SE cor. SW Section 29-27-89, is drilling at 6,075 feet in shale and lime shells.

Producers & Refiners Corp.'s No. 4 Wertz Dome, SW cor. SE Section 7-26-89, is drilling at 3,640 feet after losing and recovering bit. Same company's No. 7, Section 7-26-89, is drilling out cement. Pipe was cemented at 3,637 feet.

Midwest Refining Co.'s No. 27 Union Pacific, NW SE SE Section 11-20-81, Elk Mountain, is bottomed at 4,020 feet and cleaning out and underreaming.

Washakie County

Ohio Oil Co.'s No. 1 Strothers, SW SE NW Section 19-45-92, Neiber Dome, is drilling at 8,200 feet in the Mowry shale.

Natrona County

Midwest Refining Co.'s No. 11 Middy, C NE NE Section 23-35-79, Midway Dome, has cemented back to the bottom of the second Wall Creek at 5,193 feet and expects to make a test the latter part of the week. This well was produced for several months from the second Wall Creek before deepening to the Sundance.

Niobrara County

Indian Petroleum Co.'s No. 1, NE NW NE Section 7-35-65, Lance Creek, is drilling below 4,220 feet after cementing 4¾-inch, and is believed to be near the top of the Sundance.

Weston County

One completion in the Osage Field was reported in Sandell and others' No. 1, SE SW SE Section 12-46-64, which will pump 10 bbls. per day from sandy shale and broken sand at 1,277-1,313 feet.

Federal Oil Co.'s No. 1, NE cor. SE Section 15-46-64, is underreaming 6⅝-inch at 1,900 feet. A. N. Paysano's No. 1 Bock, NE cor. NW Section 6-46-63, is drilling at 225 feet, and the Egaso Operating Co.'s No. 15, SE cor. NE Section 17-46-64, is fishing.

Gose Oil Syndicate's No. 1, NE cor. Section 28-47-63, Soda Creek, is drilling at 5,035 feet.

Julius Peters and others' No. 1 Witzell, SE cor. NW Section 30-46-64, Fiddler Creek, is drilling at 3,025 feet.

MONTANA

Carbon County

The Ohio Oil Co. made two new locations in Carbon County this week. One is its No. 1 Kuchinski, Section 15-7s-21, on the Golden Dome, adjoining the Dry Creek Dome, and the other No. 1 Rob-

Daily! Not After the Job is Done

Cost of *Crooked Drilling* and resulting increased pumping expenses *can be eliminated!*

. . . THE Syfo Clinograph records deviation from the vertical in drilling progress.

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. . . THE test records are made on recording paper for reference purposes.

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Well owners today are insisting that the hole be surveyed as it is drilled. Complete literature will be of vital interest to you.

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1417 Esperson Building

Los Angeles, Calif.
415 Petroleum Securities Building

Calgary, Alberta, Can.
Room 1, Central Block

inson, C SW SE Section 3-7s-21, on the Dry Creek structure, half a mile to the west of its No. 1 Chapman. No. 1 Chapman, C SW SW Section 2-7-21, is drilling at 5,037 feet in the Mowry shale with the Dakota as the next objective. Its No. 2 Montana Industrial, C NW NE Section 11-7-21, and No. 2 Souders, C NE SW Section 2-7-21, have shown no change and have not yet started drilling.

Carbon Oil & Gas Co.'s No. 1 Armstrong, SW cor. NW Section 7-7s-22, has completed reaming to bottom at 5,111 feet. The first Frontier, which was 45 feet thick, was topped at 4,413 feet, and the second Frontier, 47 feet thick was topped at 4,700 feet. Cores from both sands showed oil and gas saturation.

Toole County

One completion was reported in the Kevin-Sunburst Field in the Arronow Oil Co.'s No. 2 Ellington, NW SW Section 14-35-3w, which was dry at 1,500 feet.

Western Natural Gas Co. has made a location for its No. 1 Hicks, C NW NE Section 26-37-4e, Strode Dome, in the Sweetgrass Hills district.

Oregon Oil Syndicate's No. 1 Barthelote, SW NE SE Section 20-36-2e, Barthelote district, is drilling at 1,550 feet.

Hannah-Porter Co.'s No. 3 Iowa Holding, NW SE SE Section 2-37-4w, Buckley-Border, is drilling at 1,400 feet, and Askalta Oil, Ltd.'s No. 2 Farbo, SW SE NE Section 2-37-4w, is drilling at 2,300 feet. Cosmos Petroleum, Inc.'s No. 3 Iowa Holding, NW NE SE Section 2-37-4w, has rig up.

Glacier County

L. B. O'Neil's No. 1 Cummings, C SW Section 22-36-5w, Cut Bank gas field, which was reported a completion last week, gauged 28,600,000 feet. Total depth is 2,694 feet. It not only extends the productive area a mile to the northeast, but is one of the largest wells so far completed in the field. O'Neil's No. 1 McNeil, C NE Section 23-35-5w, is drilling at 3,500 feet.

Browning Development Co.'s No. 1 Reickhoff, SE cor. NE Section 3-34-6w, Cut Bank area, has rig completed, and R. C. Tarrant's No. 1 Hogland, NW cor. SW Section 13-34-6w, is drilling at 1,400 feet.

Fulton Petroleum Co.'s No. 1 Blackfeet, SW NE NE Section 28-36-12w, Milk River district, is drilling at 2,735 feet.

Rosebud County

Prairie Oil & Gas Co.'s No. 1-XX, Contract 3, NE SW NW Section 26-10-39, Porcupine Dome, has suspended drilling at 4,505 feet. This is the first of a number of tests drilled on this structure that succeeded in getting through a big water sand at 2,200 to 2,400 feet which makes as high as 100,000 bbls. of water per day. It found considerable water in horizons below the big water. It may be drilled deeper at a later date.

Liberty County

California Co.'s No. 1 Eleanor, SE SE Section 11-33-6e, Utopia Dome, has got through the bad formation at 3,244 feet which showed considerable oil and gas, and is drilling at 3,290 feet.

People's Oil & Gas Co.'s No. 1 First National Bank, C SE NW Section 17-36-6e, Bear's Den, is drilling at 2,000 feet.

Teton County

Earl Oil Corp.'s Ltd.'s No. 1 Gad, SE cor. NE Section 22-22n-8w, Sun River district, is preparing to resume at 3,730 feet. It is bottomed in the Colorado shale. A cave will be cemented. It is planned to carry the 8¼-inch to 4,000 feet, or more.

California Co.'s No. 1 Sullivan, NW NE NW Section 34-27-7w, Bynum district, is drilling at 2,325 feet.

Fergus County

H. C. Rowland's No. 1, SE SW Section 12-17-23, Black Butte, has material on ground.

Cascade County

Charles Merz and others' No. 1 Sheffelt, SE cor. SW Section 4-21-4e, Black Horse district, is drilling at 300 feet, and Buscher & Cassidy's No. 1 Johnson, NE Section 19-22-3e, Benton Lake, is fishing for tools at 1,010 feet.

UTAH

Utah Southern Oil Co.'s No. 1 Balsey, C NE NE Section 31-23-21, Grand County, is shut down at 4,243 feet in salt, and Diamond Oil Co.'s No. 1, SE NW Section 16-8s-5e, Utah County, has cemented 5⅛-inch at 3,410 feet.

IDAHO

R. J. Berry and others' No. 1 Kramlich, Section 5-9n-4w, is preparing to drill in after cementing 8¼-inch at 2,045 feet on top of sand which showed considerable gas in a near-by well which was lost before a test could be made.

Pipe Line Runs

Average daily pipe line runs for the week ended November 7:

	Bbls.
WYOMING	
Salt Creek	22,020
Big Muddy	1,760
Greybull	10
Dallas-Derby	920
Dutton Creek	80
Elk Basin	590
Ferris	30
Frannie	580
Grass Creek	2,080
Hamilton Dome	940
Hudson	170
LaBarge	850
Lance Creek	220
Lost Soldier	4,250
Oregon Basin	780
Osage	1,180
Pilot Butte	40
Rock River	1,820
Poison Spider	80
Teapot	20
Total Wyoming	38,420
MONTANA	
Buckley-Border	560
Cat Creek	880
Dry Creek	290
Kevin-Sunburst	4,660
Lake Basin	70
Pondera	1,050
Total Montana	7,510
COLORADO	
Florence	420
Fort Collins	1,000
Iles	920
Moffat	820
Orchard	800
Rangely	20
Tow Creek	310
Total Colorado	4,310
NEW MEXICO	
Rattlesnake	775
Hogback	450
Table Mesa	80
Artesia	500
Cap Rock	610
Hobbs	37,085
Jal	1,035
Lea City	2,420
Eunice	500
Total New Mexico	43,485
Total Rocky Mountain area	93,725
Total previous week	93,867
Difference	132

NORTH AND WEST TEXAS

(Continued from Page 51)

sand 694-701 feet, initial production 20 bbls. oil and 25 bbls. of water, total depth 701 feet. Beavers and others' No. 4 Belknap, oil sand 658-68 feet, initial production 30 bbls., total depth 670 feet. Belknap, oil sand 652-58-70-93-710 feet, initial production 55 bbls., total depth 710 feet. Same company's No. 11 Belknap, oil sand 670-79-700 feet, initial production 34 bbls., total depth 716 feet. HY Oil Co.'s No. 2 Larimore, oil sand 695-708 feet, initial production 72 bbls., total depth 708 feet.

King Royalty Co.'s No. 26 Larimore, oil sand 699-708 feet, initial production 72 bbls., total depth 708 feet. Same company's No. 29 Larimore, oil sand 659-62 feet, initial production 240 bbls., total depth 602 feet. Kleiner & Riggs' No. 3 Larimore, dry and abandoned, total depth 767 feet. Lee & Brasher's No. 1 Jeffery, dry and abandoned, total depth 835 feet. C. C. Mason's No. 1 Jeffrey, dry and abandoned, total depth 834 feet. Petroleum Production Co.'s No. 1 Haygood, dry and abandoned, total depth 742 feet. R. Seitz's No. 4 Finch, oil sand 625-35 feet, initial production 48 bbls., total depth 637 feet. R. Seitz's No. 5 Finch, dry and abandoned, total depth 703 feet. Wellis and others' No. 7 Belknap, oil sand 634-41 feet, initial production 57 bbls., total depth 641 feet. L. V. Wood's No. 1 Brooks, dry and abandoned, total depth 505 feet. Jack Anthony and other's No. 1 Robinson, dry and abandoned, total depth 796 feet.

Cooke County

Hutton, Hess & Hutto's No. 1 E. A. Morley, dry and abandoned, total depth 1,102 feet.

POOL DEVELOPMENT HAS BEEN ONE-SIDED

(Continued from Page 32)

ness, porosity, and permeability of the reservoir, and is used to determine the volume of oil and gas under the individual leases covering the pool.

An improved method has been developed recently by which the relative oil content of the various properties can be determined. This method is superior to the method of allocating values on sand thickness, porosity, permeability, and percentage recovery, and may eventually supersede it. The new method utilizes information obtained from flow characteristics of the wells. Any time after a well is completed, it is allowed to flow at various rates by changing the choke size, and the bottom hole pressure is carefully measured. The relation between the rate of flow and change in bottom hole pressure gives the engineer a measure of the ability of the formation, in the area surrounding the well, to produce oil. The ability of the formation to produce oil in various places gives an accurate measure of the relative value of various properties.

There are a large number of pools in which exploration will show that certain tracts contain predominantly free gas. Owners of such tracts have a right to the gas itself, but not to the energy contained in the gas. This energy is common property of the owners of the pool. Owners of tracts underlaid by gas are entitled to recover it, but in doing so they must not dissipate the energy of the pool as a whole.

The determination of the extent of participation in the proceeds from the pool by owners of tracts underlaid by gas offers one of the most difficult problems in establishing principles governing equitable and efficient oil pool development, but it can be satisfactorily solved.

In order to compensate the owners of the free gas, there are three proposed plans:

1. The value of the free gas compared to the oil may be estimated, and the owners of the free gas given an over-riding royalty on the oil produced.

2. An estimate may be made of the volume of free gas, and this purchased in place by the owners of the oil.

3. The pool may be operated so that none of the free gas is wasted, and after oil production ceases the free gas owners are left with their gas to dispose of as they see fit. Unless the oil can be produced with only its dissolved gas, this would involve repressuring or the injection of gas into the free gas area. In order to compensate the owners of free gas for the delay in their income, they could be currently paid the equivalent of the interest in the delayed income.

Production

After the well spacing program has been worked out, and the productivity of the tracts in the pool determined, production of oil should be started on a commercial basis. The problem then becomes one of so utilizing the reservoir energy as to move the maximum quantity of oil to the well, and so control the forces comprising reservoir energy that a minimum volume of oil is left in the sand as the water level rises in the formation and the pressure existing in the sand diminishes. Equity is attained by maintaining an even distribution of reservoir pressure over the pool at all times. To accomplish this the wells must be produced with a minimum gas-oil ratio in order to produce the least amount of dissolved gas from oil left behind in areas remote from the well. Gas-oil ratio is not the only determining factor, as the rate of water encroachment is of prime importance. A uniform rise of the water table in a producing formation, with accompanying maintenance of hydraulic pressure, is an important factor in keeping equitable distribution of reservoir pressure, as well as preventing underground waste. It is important to maintain for the longest period of time reservoir pressures which approximate the original rock pressures, and which do not decline to a pressure less than that necessary to flow the oil from the well. In most pools it is advisable to return to the formation as much of the gas produced with the oil as possible, in order to maintain the proper reservoir pressure. In most cases it is necessary to start the return of gas to the reservoir from the beginning, in order to maintain the desired pressure relationship. However, a close study of the effect of the water-drive should be made in determining the proper time for starting injection. In many pools it is generally recognized that beneficial effect is obtained by returning certain of the lighter fractions contained in the gas, such as casinghead gasoline, butane, propane, etc., to the formation under pressure.

Advantages Gained

When an oil pool is developed and produced in accordance with the basic principles outlined above, certain results can be assured.

1. Equitable distribution of reservoir content among the owners in the pool. This follows the principle that the various leaseholders are entitled ultimately to an amount of oil equal to that originally underlying their land, although the oil may not be produced through wells located on their land.

2. Greater ultimate recovery of oil. It is generally agreed among engineers that a much higher recovery per acre will be secured under methods embodying the principles outlined above than under old methods in which dissipation of reservoir energy is rapid and uncontrolled. A recovery figure generally used for the old pools in the Mid-Continent is 20 per cent of the oil originally contained in the sand. It is believed that operators can easily secure an additional 20 per cent of the oil content of the sand. It is even estimated by some that 50 per cent of the oil contained in the sand will be recovered by the adoption of improved methods.

3. Reduction in operating expenses. A higher percentage of the recoverable oil can be produced by flowing. The oil which is flowed from a well is produced cheaper than by pumping, gas lifting or other artificial means. Costs are also lowered through elimination of wells, orderly drilling, less maintenance, and avoiding unnecessary lifting of water.

Operating costs can be reduced under co-operative operations, as well as under strict unitization, as long as the fundamental engineering principles are adhered to. Additional economies can be effected by a combination of operations under one management. Kettleman Hills, Calif.; Big Lake, Tex.; Yates Pool, Tex.; Van Pool, Tex.; Sugarland, Tex.; Raccoon Bend, Tex.; and Cook Pool, Tex.. are operated in a manner to incorporate many of the principles outlined above. Some of these pools are under one management; and, in others, the individual operators retain complete control of their own operations, and accomplish, in a great degree, the same economies and advantages as under unitized projects. Although none of these operations contain all the good points of the ideal, they represent substantial progress towards the goal for which engineers and all progressive companies are striving.

LIGHTER OILS STRONG IN GULF COAST AREA

HOUSTON, Tex., Nov. 9.—While lighter oils have been materially stronger the advances in crude the past week so far have not been reflected in any price strengthening of the heavier oils and lub stocks, pale and red oils still are firm at prevailing quotations of a week ago.

Lower viscosity lubs are more freely available but strong in price. Inquiries of the lighter viscosity oils are fairly active, but little actual new business is reported.

Gulf gasolines are materially stiffer with 65 octane and lower U. S. Motor fuel quoted at 4¼ to 4½ cents and gasoline above 65 octane quoted from 4⅜ cents up according to grade. Tank wagon advances also have resulted in a firmer local tank car situation with motor fuel held at a minimum of 5 cents. Fuel oils and gas oils are unchanged.

SUPERSENSITIVE

The gas relief valves on your vapor recovery systems must be *Supersensitive*—like the Davis. You are dealing with pressures registered by the fraction of an inch on a water gauge. Efficiency depends on the sensitiveness of the valves in relieving the low pressure vapors into the compressor suction line and preventing a vacuum being formed in the tanks.

The Davis *Supersensitive* Gas Relief Valve is truly *super sensitive.* Its action is not affected by the rate of flow. An internal dash pot steadies the operation and insures accuracy. Movable parts are counterbalanced, and the entire valve protected by a weather hood so it may be used in an exposed position.

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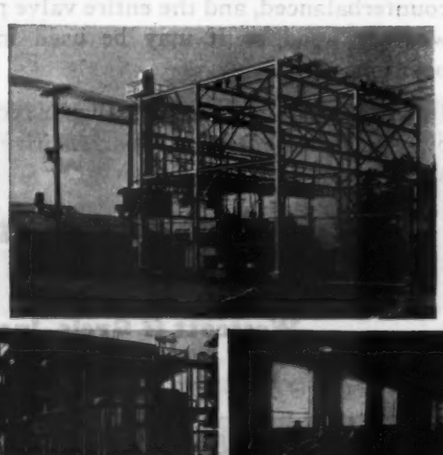
Aerial view of the Barnsdall Refinery at Okmulgee, Oklahoma

BARNSDALL *The World's First Refiner*

keeps pace with

ELECTRIC POWER



Since 1860, more than seventy-two years ago, when William Barnsdall built and put into operation the world's first refinery at Oil Creek, Pa., Barnsdall's BE SQUARE Petroleum products have meant quality and service to motorists the world over. To keep intact the original merit of its products, and at the same time meet the universal demand, Barnsdall has modernized its production with dependable, economical central station power. The large plant at Okmulgee is supplied from the vast, inter-connected system of the Public Service Company of Oklahoma.

Views at left show: (1) Sub station at Okmulgee Refinery of Barnsdall Refineries, Inc. (2) Cracking stills using electric pumps, and (3) Interior view of circulating water pump house.

PUBLIC SERVICE

Company of Oklahoma

PUBLIC SERVICE BLDG., TULSA, OKLA. Fred W. Insull, President

WILDCAT OPERATIONS IN WEST TEXAS

(Continued from Page 51)

H. F. Wurtz' No. 1 E. A. Ibbetson et al, 330 ft. from N and E lines of NW, Sec. 16, Blk. 46, Twp. 3s, G.M. M.Br.&A. Sur. ..... S.D. 3,280 ft.

EL PASO COUNTY

Tri-State Oil Co.'s No. 1 Bobadella, 1,325 ft. from S and E lines Sur. 254, S.F. No. 7,247 ..... Resetting 8¼-in. casing; total depth 1,725 ft.

FISHER COUNTY

The Texas Company's No. 1 Daniels, 357 ft. from S and 330 ft. from W lines of Sec. 194, Blk. 1, B.B.&C. Sur. ..... Drlg. 3,095 ft.

Cranfill & Reynolds' No. 1 George, 400 ft. from N and 380 ft. from E. Sec. 200, Blk. 1, B.B.&C. Sur. ..... Total depth 3,378 ft.; will run 5 3/16-in. casing.

Cranfill & Reynolds' No. 1 Snipe, 330 ft. from N and W lines of Sec. 195, Blk. 1, B.B.&C. Sur. ..... Spudded.

GAINES COUNTY

Texas Consolidated Oil Co. et al's No. 1 Jones, 2,312 ft. from NE, Sec. 4, Blk. A-8, P.S.L. Sur. ..... T.D. 4,700 ft.

GARZA COUNTY

Pandem Oil Corp.'s No. 1 Justice, 330 ft. from S and W of Sec. 12, Blk. 4, H.&G.N. Sur. ..... Spudded and S.D.

Penny & Posey's No. 1 Justice, 1,980 ft. from S and 1,680 ft. from E of Sec. 25, Blk. 6, H.&G.N. Sur. (3,500-ft. cable tool test) ..... Drlg. 3,320 ft.

HOWARD COUNTY

Green O. & R. Co.'s No. 1 Denman, 990 ft. from S and 2,310 ft. from W Sec. 14, Blk. 29, Twp. 1s, T.&P. Sur. Spudded and S.D.

Merrick & Lamb's No. 2 Chalk, 990 ft. from the N and W lines of Sec. 125, Blk. 29, W.&M.W.R.R. Sur. .... Drlg. 2,866 ft.

L. C. Harrison et al's No. 1 L. C. Denman, 2,310 ft. from S line and 330 ft. from E line of Sec. 10, T.&P.R.R. Sur., Blk. 30 ..... Location.

IRION COUNTY

Davis et al's No. 1 Suggs, 1,560 ft. from S and 925 ft. from W Sec. 3,081, Blk. 28, H.&T.C. Sur. ..... Drlg. 4,860 ft.

Denny & Andrews' No. 1-A Tankersley, 200 ft. from S and 2,000 ft. from E of Sec. 709, J. P. Imhoff Sur... S.D. 463 ft.

Ellis Flanery Corp.'s No. 1 Nutt, 1,350 ft. from N and 450 ft. from E of Sec. 694, Kheikenholm Sur. ..... Fishing for tools 2,680 ft.

Stanolind Oil & Gas Co.'s No. 1 Williams, 1,320 ft. from S and E of Sec. 1,196, T.T.R.R. Sur. ..... Fishing for tools 6,730 ft.

Straughn & Adkins Bros.' No. 1 Lee, 1,080 ft. from W and 420 ft. from N of Sec. 729, C. Kaiser Sur. ..... Shut down 975 ft.

JONES COUNTY

Abers et al's No. 1 Burton, 150 ft. from S and 175 ft. from E of 43.4-acre tract in G. Martinez Sur. ..... S.D. 1,005 ft.

LOVING COUNTY

Ervin & Mahres' No. 1 Thrope, 2,310 ft. from E and 330 ft. from S Sec. 46, Blk. 53, T.&P. Sur. ..... S.D. 810 ft.

Slack's No. 1 Lynd, 990 ft. NE and 330 ft. SE of Sec. 3, Blk. 2, W.&N.W. Sur. ..... Drlg. 3,050 ft.

Falbre & Evans' No. 1 Dean, 330 ft. from NE and 990 ft. from NW Sec. 79, Blk. 33, H.&T.C. Sur. ..... S.D. 2,500 ft.

Lewis & Slagel's No. 1 Johnson, 330 ft. from N and 1,650 ft. from W Sec. 6, Blk. 56, Twp. 1, T.&P. Sur... Spudded and S.D.

Lockhart & Co.'s No. 3 Bowen & Wells, 330 ft. from NE and SE of Sec. 92, Blk. 1, W.&N.W. Sur. ..... S.D. 3,385 ft.

Tennant et al's No. 1 Martin, 990 ft. from NW and SW Sec. 66, Blk. 1, W.&N.W. Sur. ..... Drlg. 2,365 ft.

MENARD COUNTY

Priest's No. 1 Sorrel, 1,000 ft. from E and 200 ft. from S cor. Sec. 132, E.L.R.R. Sur. ..... S.D. 2,860 ft.

PECOS COUNTY

Dittman's No. 1 Sanford, 330 ft. from NW and 1,650 ft. from NE of Sec. 55, Blk. 10, H.&G.N. Sur. ..... T.D. 1,300 ft.

Slaughter et al's No. 1 Sun Yates, 60 ft. S of Sun Oil Co.'s No. 1 Yates, Sec. 59, Blk. 1, I.&G.N. Sur. ..... Material.

REAGAN COUNTY

Carl Cromwell et al's No. 1 University, 1,320 ft. from S line and 1,320 ft. from E line of Sec. 4, University Blk. Y ..... Spudded 55 ft.

Big Lake Oil Co.'s No. 6-C University, 1,370 ft. from S and 1,000 ft. from E Sec. 12, Blk. 2 ..... Drlg. 2,825 ft.

REEVES COUNTY

Cunningham et al's No. 1 Wright, 1,320 ft. from S and W Sec. 58, Cassel's Sur. ..... Spudded and S.D.

F. McDorman et al's No. 1 Ray Roberts et al, 2,310 ft. from S and E lines of Sec. 22, Blk. 59, P.S.L. Sur.... Spudded.

James & Milton's No. 1 Patterson, 330 ft. from N and W of Sec. 21, Blk. 73 ..... Testing wtr. shutoff 3,330 ft.

Lee O. White et al's No. 1 Hershorsor, 330 ft. from N and W lines of Sec. 5, Blk. 51, Twp. 10, T.&P. Sur... S.D. 5,044 ft.

RUNNELS COUNTY

Dutton et al's No. 1 Dean, 5,475 ft. from NE and 1,048 ft. from NW in J. Heil Sur. No. 519 ..... S.D. 2,700 ft.

SCHLEICHER COUNTY

Eastland Oil Co.'s No. 1 Joe Tisdale, C Sec. 29, Blk. M, G.H.&S.A. Sur. ..... S.D. 4,500 ft; contract depth.

Wesner et al's No. 1 Nicks, 2,310 ft. from N and 2,362 ft. from E of Sec. 77, Blk. LL, T.C. Sur. ..... S.D. 5,060 ft.

George Wilson's No. 1 Page, Sec. 40, Blk. L, 1,290 ft. from N, 1,570 ft. from W, G.H.&S.A. Sur. ..... S.D. 5,053 ft.

SCURRY COUNTY

G. E. Dickman and R. B. Pender et al's No. 1 F. C. Davis, 1,000 ft. N and 1,770 ft. W of SE cor. of Sec. 275, Blk. 3, H.&T.C. Sur. ..... S.D. 5,100 ft.

Scurry County Oil Exchange's No. 1 Earnest, 2,310 ft. from N and W Sec. 68, Blk. 3, H.&G.N. Sur. ..... Spudded and S.D.

Seifert & Dibble's No. 1 T. M. Blackburn, 2,310 ft. from N and 2,310 ft. from W line of Sec. 153, Blk. 97, H.&T.C. Sur. ..... Drlg. 3,511 ft.

Simon & Brock et al's No. 1 Cruse, 2,310 ft. from S and E Sec. 119, Blk. 97, H.&T.C. Sur. ..... S.O. 1,798, 1,820, 1,850 ft; S.D. 2,500 ft.

TERRELL COUNTY

Big Bend Oil Co.'s No. 1 Bassett, C NW Sec. 155, Blk. D, M-K-T Sur. ..... S.D. 2,669 ft.

Keck Pecos Trust Co.'s No. 1 Hamilton, C Sec. 6, Georgetown Ry. Sur. ..... S.D. 3,150 ft.

Miller Bros.' No. 1 Allison & Burke, C NW cor. Sec. 10, Blk. 176, T.&P. Sur. ..... S.D. 120 ft.

Mid-Kansas Oil & Gas Co.'s No. 1 Goode, 2,152 ft. from E and 330 ft. from S Sec. 26, Blk. 161, G.C.&S.F. Sur. S.D. 6,120 ft.

Jones et al's, No. 1 Pankenham, C SE NW Sec. 43, Blk. B-2, C.C.S.D.&R.G.N.G. Sur. ..... S.D. 2,545 ft.

Sides et al's No. 1 Phelps, 2,167 ft. from N and 2,462 ft. from W Sec. 5, G. W. Turley Sur. ..... Location.

TOM GREEN COUNTY

Belding & Dutton's No. 1 Norsworthy, 1,640 ft. from S and 587 ft. from E of John McNeese Sur. ..... S.D. 760 ft; S.O. and gas 725 ft.

Mintex Oil Co.'s No. 1 Campbell Est., 446 ft. from S and 630 ft. from W of Sec. 180, Dist. No. 11, S.P. Sur.... S.D. 1,994 ft.

Pratt & Hancock's No. 2 Lewis, 100 ft. N and 330 ft. E of most northerly SW cor. of Joshua S. Grant Sur. No. 2 ..... S.D. 260 ft.

UPTON COUNTY

Farley et al's No. 1 Lane, 2,310 ft. from S and 990 ft. from W Sec. 36, Blk. 1, M.-K.-T. Sur. ..... Drlg. 2,000 ft.

T. P. Coal & Oil Co.'s No. 2 Shirk, 1,650 ft. from S and 330 ft. from E of Sec. 1, Blk. 3, M.-K.-T. Sur. ..... Drlg. 790 ft.

VAL VERDE COUNTY

Independent Operators' No. 1 Whitehead, SE SE Sec. 10, Blk. 4, I.&G.N. Sur., elev. 1,175 ft. ..... S.D. 5,360 ft.

O. O. Owens' No. 1 Mills, Sec. 128, Blk. 1, I.&G.N. Sur., elev. 2,130 ft. ..... S.D. 6,780 ft.

WARD COUNTY

Abell Bros.' No. 1 Sloan, 330 ft. from NW and NE Sec. 24, Blk. 5, H.&T.C. Sur. ..... Rig.

Atlantic O. & P. Co.'s No. 1 Archenhold, 2,310 ft. from NE line and 330 ft. from NW line of Sec. 33, H.&T.C. Sur., Blk. 5 ..... Moving in.

Boogher's No. 1 fee, 235 ft. from SE and 3,553 ft. from NE Sec. 11, Blk. 5, H.&T.C. Sur. ..... S.D. 2,111 ft.

Bradford-Bentley's No. 1 Beatty, 330 ft. from SW and NW of Sec. 3, Blk. 34, H.&T.C. Sur. ..... Drlg. 795 ft.

Eppenauer's No. 1 Purcell, 365 ft. from SW and 1,650 ft. from SE of Sec. 17, Blk. 34, H.&T.C. Sur. ..... Rig.

H. V. Greer's No. 1 Carr, 150 ft. from NW and 510 ft. from SW Sec. 12, Blk. 5, H.&T.C. Sur. ..... Spudded and S.D.

Hankinson et al's No. 1 Emery, 3,090 ft. from SE and 510 ft. from SW Sec. 26, Blk. 5, H.&T.C. Sur. ..... S.D. 2,238 ft.

Moran & Miles' No. 1 Boogher, 3,603 ft. from NE and 1,303 ft. from SE Sec. 11, Blk. 5, H.&T.C. Sur. ..... S.D. 715 ft.

R. F. Owen's No. 1 Lee, 1,344 ft. from NW and 4,533 ft. from SW Sec. 1, J. Howe Sur. ..... S.D. 210 ft.

Prairie Oil & Gas Co.'s No. 1 Edmonson, 330 ft. from NW and 2,310 ft. from SW of Sec. 23, Blk. 5, H.& T.C. Sur. ..... Drlg. 3,240 ft.; 500,000 ft. of gas 2,083-2,106 ft.

Prairie Oil & Gas Co.'s No. 2 Edmonson, 330 ft. from NW and SW of Sec. 23, Blk. 5, H.&T.C. Sur. ..... Location.

Rector Oil Co.'s No. 1 Smith, 1,320 ft. from N and E, Sec. 22, Blk. A, G.M.M.B.&A. Sur. ..... S.D. 3,602 ft.

Paul Ryan et al's No. 1 J. S. Reynolds, 4,110 ft. from NE line and 150 ft. from NW line, Sec. 12, Blk. 5, H.&T.C. Sur. ..... S.D. 2,040 ft.

Sudderth & Carey's No. 1 J. H. Boogher et al, 150 ft. from SW and SE lines of Lot 24, Sec. 11, Blk. 5, H.&T.C. Sur. ..... Spudded and shut down.

Stanolind Oil & Gas Co.'s No. 1 Brown, 330 ft. from NW and SW Sec. 26, Blk. B-29 ..... Fishing 2,265 ft.; 5,000,000 ft. gas 2,233-35 ft.

Shipley et al's No. 1 Monroe, 330 ft. SE SW Sec. 3, Blk. 1 ..... Total depth 4,665 ft.; top Delaware lime 4,630 ft.; top sand 4,663 ft.; filled up 170 ft. with oil in 2 hrs.

White et al's No. 1 Burtner, 150 ft. from NE and 515 ft. from SE of Sec. 5, Blk. 32, H.&T.C. Sur. ..... S.D. 755 ft.

WINKLER COUNTY

Liner Drlg. Co.'s No. 1 Campbell, 350 ft. from N and E cor. Sec. 2, Blk. B-5 ..... S.D. 4,640 ft.

Richardson's No. 1 Sealy, 330 ft. from S and W of Sec. 92, Blk. A, G.M.M.B.&A. Sur. ..... Rig up.

WILDCAT OPERATIONS IN TEXAS PANHANDLE

(Continued from Page 51)

Parton Holt and Shell Pet. Corp.'s No. 1 Morse, 330 ft. S and E, Sec. 6, Blk. 26, H.&G.N. Sur. ..... Drlg. 2,180 ft.

Jean Pet. Co.'s No. 1 Furneaux Bros., 330 ft. N and W, cor. SE, Sec. 200, Blk. B-2, H.&G.N. Sur. ..... Fishing 3,010 ft.

Graham et al's No. 1 Webb, 330 ft. from N and E of E half NE, Sec. 62, Blk. 25, H.&G.N. Sur. ..... Rig.

Jewel Oil Co.'s No. 1 Meers, 330 ft. from S and W of NW SW, Sec. 106, Blk. 3, I.&G.N. Sur. ..... Spudding.

Magnolia Pet. Co.'s No. 1 Arnold, 330 ft. from S and E, Sec. 149, Blk. 3, I.&G.N. Sur. ..... Cellar.

Magnolia Pet. Co.'s No. 1 Heaston, NE cor. S½ NE, Sec. 164, Blk. 3, I.&G.N. Sur. ..... Set 8-in. csg. 2,600 ft.

Nelson et al's No. 1 Crews, 330 ft. S and E, NW, Sec. 12, Blk. 25, H.&G.N. Sur. ..... S.D. 2,619 ft.

Nipper et al's No. 1 Morse, 330 ft. from N and E, Sec. 1, Blk. 26, I.&G.N. Sur. ..... Running 8-in. csg. 1,840 ft.

Prairie Oil & Gas Co.'s No. 1 Morse, 330 ft. from N and E of Sec. 4, Blk. 26, H.&G.N. Sur. ..... Rig.

Pulse-Shell Pet. Corp.'s No. 1 Wright, 330 ft. from S and W of Sec. 13, Blk. 3, I.&G.N. Sur. ..... Drlg. 2,535 ft.

Skelly Oil Co.'s No. 2 Heaston, 330 ft. from S and E N half NE, Sec. 164, Blk. 3, I.&G.N. Sur. ..... Drlg. 1,580 ft.

Saunders et al's No. 2 Sullivan, 822 ft. from W and 231 ft. from NE, 160 ft. S, 264 ac. of N½, Sec. 136, Blk. 3, I.&G.N. Sur. ..... Will plug back to 3,275 ft. and shoot.

Sullivan & Ochiltree's No. 1-A Morse, 330 ft. S and W, N½ NE, Sec. 15, Blk. A-9 H.&G.N. Sur. ..... Rig up and S.D.

Tarber's No. 1 Saunders, 330 ft. N and W, Sec. 3, Blk. 1, B.B.&S.F. Sur. ..... Location.

Quicksand Oil Co.'s No. 1 Chapman, 250 ft. from N and E, Sec. 69, Blk. 25, H.&G.N. Sur. ..... S.D. 350 ft.

Vulcan Corp.'s No. 1 Carpenter, 330 ft. from S and E, Sec. 25, Blk. 25, H.&G.N. Sur. ..... S.D. for Csg. 1,500 ft.

HUTCHINSON COUNTY

Danciger O. & R. Co.'s No. 1 Johnson, 330 ft. N and W, SE, Sec. 34, Blk. Y, A.&B. Sur. ..... Spudded and S.D.

Deal O. & G. Co.'s No. 2 Sanford, 330 ft. N and E of N 80 ac., S 160 ac., Sec. 81, Blk. 46, H.&T.C. Sur. .... S.D. 450 ft.

Huber Prod. Co.'s No. 1 Johnson Bros. (Premier), 330 ft. N and E of W 60 ac., N 80 ac., NW, Sec. 3, Blk. Y, A.&B. Sur. ..... S.D. 3,016 ft.

Smith & McDaniel et al's No. 4 Pitcher, 990 ft. from S and 330 ft. from W, Sec. 19, Blk. M-21. Sur. ..... Rig up.

Smith & Daniels' No. 3 Pitcher, 990 ft. from S and 330 ft. from E. Sec. 19, Blk. M-21, T.C.R.R. Sur. ..... Drlg. 3,095 ft.

Skelly Oil Co.'s No. 1 Johnson Bros., 660 ft. S and W, SE, Sec. 30, Blk. Y, A.&B. Sur. ..... Top pay 3,070-95 ft; 500 ft. oil in hole.

Timms-Deatch's No. 4 Moore, 330 ft. N and W, Sec. 124, Blk. 4, I.&G.N. Sur. ..... Rig.

LIPSCOMB COUNTY

Okla. Public Service Co.'s No. 1 C. W. Jones, NE SW, Sec. 100, H.&T.C. Sur. ..... T.D. 5,003 ft.

MOORE COUNTY

Gulf Prod. Co.'s No. 1 Burnett, 330 ft. from N and W, Sec. 356, Blk. 44, H.&T.C. Sur. ..... Drlg. 2,315 ft.

Interstate's No. 1 Nield, C NE, Sec. 18, Blk. 44, H.&T. C. Sur. ..... Rig up.

Magnolia Pet. Co.'s No. 1 Nelid, 330 ft. from S and E of N½, Sec. 361, Blk. 44, H.&T.C. Sur. ..... Location.

Pollard et al's No. 1 Hall, 730 ft. S and E, NE, Sec. 131, Blk. 3-T, T.&N.O. Sur. ..... Rig on ground.

Sunray Oil Co.'s No. 3 Jones, 330 ft. N and W, W½ SW, Sec. 164, Blk. 3-T, T.&N.O. Sur. ..... Rig on ground.

Texas Interstate P. L. Co.'s No. 1-23 Thompson, C N½ NE, Sec. 23, Blk. 44, H.&T.C. Sur. ..... Location.

Texas Interstate P. L. Co.'s No. 1-37 Sneed, C NW, Sec. 37, Blk. 6-T, T.&N.O. Sur. ..... Location.

Texas Interstate P. L. Co.'s No. 1 Coon, 2,025 ft. from N and 2,640 ft. from W, Sec. 149, Blk. 44, H.&T.C. Sur. ..... Drlg. 2,765 ft.

Texhoma Natural Gas Co.'s No. 3 Coon, center of Sec., Sec. 151, Blk. 44, Sur. ..... Rig.

Texhoma Nat. Gas Co.'s No. 1 Coon-Sneed, center Sec. 8, Blk. 6-T, T.&N.O. Sur. ..... Drlg. 2,732 ft.

MOTLEY COUNTY

Matador Oil Corp.'s No. 1 Owens, C NE, Sec. 10, Blk. G, B.&B. Sur. ..... S.D. 530 ft.

OLDHAM COUNTY

Amalgamated German-American Oil Corp.'s No. 1 Norton, 330 ft. S and E, Sec. 12, T.&N.O. Sur. ..... S.D. 400 ft.

Chambers et al's No. 1 Herring, CNL, Sec. 20, Blk. S, G.C.&S.F. Sur. ..... S.D. 2,945 ft.

PALMER COUNTY

Magnolia Pet. Co.'s No. 1 Wilson, 330 ft. from N and W of SE, Sec. 73, H. Kelly Sur. ..... Spudding.

ROBERTS COUNTY

Chicken Creek Oil Co.'s No. 1 Ledrick, 330 ft. N and W, Sec. 55, Blk. C, G.&M. Sur. ..... Drlg. 1,825 ft.

Travis et al's No. 1 Cunningham, 330 ft. S and W, Sec. 74, Blk. M-2, H.&G.N. Sur. ..... S.D. 2,690 ft.

WHEELER COUNTY

Clarity et al's No. 1 Porter, 330 ft. S and W, SE, Sec. 2, Blk. A-9, H.&G.N. Sur. ..... S.D. for 6-in. csg. 2,150 ft.

EAST CENTRAL TEXAS WILDCATS

(Continued from Page 50)

ELLIS COUNTY

Clark Brooks' No. 1 C. W. Golliday, 300 ft. from S line and 300 ft. from E line of tract and survey, John Bones Sur. ..... S.D. 1,200 ft.

E. M. Roger's No. 1 John Lee Winn, 1,650 ft. from E and 510 ft. from S of Orland, Orlo Wheeler Sur. .... S.D. 1,435 ft.

Worthen Pet. Co.'s No. 1 Cerf, 2½ miles NE of Ennis . Shut down 2,225 ft.

FRANKLIN COUNTY

Tom Harper's No. 1 fee, 180 ft. from N line and 200 ft. from E line of 116-ac. tract, W. M. Dawson Sur. ..... Derrick.

GREGG COUNTY

Atlantic Oil & Prod. Co.'s No. 1 Turner estate, 893 ft. from N line and 1,857 ft. from E line of lease and survey, W. C. Wakeland Sur. ..... Derrick.

Alma Petroleum Co.'s No. 1 J. B. Watson, 330 ft. from S line and 330 ft. from E line of 35-ac. tract, Thompson Allen Sur. ..... Spudded.

Artic Petroleum Co.'s No. 1 King, 57 ft. S of most northerly NW cor. and 104 ft. E at right angles in 2-in. tract, Chisum Sur. ..... Waiting on cement to set.

Atlantic and Pacific's No. 1 O. R. Johnson, 340 ft. from S line and 390 ft. from W line of survey, L. J. Rigsby Sur. ..... Drlg. 3,547 ft.; top Pecan Gap 2,514 ft.; base 2,980 ft.

Bond et al's No. 1 J. R. Fenton, 360 ft. from S line and 252 ft. from E line of 20-ac. of west 30 acres, D. Sanches Sur. ..... Location.

Barnett and Foshee's No. 1 Foshee estate, center Blk. 15, SE offset to Finlayson and Beck's No. 1 Sturvinant, H. R. Holit Sur. ..... Location.

Bishop Oil Corp.'s No. 1 Richie, N offset to Shasta Oil Co.'s No. 1, Carl Rhodes Sur. ..... Top sand 3,560 ft.; T.D. 3,590 ft.

Brannon et al's No. 1 W. A. Horton, center of 2-ac. lease, John Ruddle Sur. ..... Fishing 3,518 ft.

Buchanan et al's No. 1 George Ritchie, 120 ft. N and 15 ft. W of Monsell and Currie's No. 1 Church Block No. 4, M. Dillard Sur. ..... Derrick.

Bramlette's No. 1 Goforth, 170 ft. due N of NW cor. of Sun-Hilburn-Lloyd lease in Chisum Sur. ..... Rig up and S.D.

Bob et al's No. 1 T. L. Broy, 290 ft. from E and 1,640 ft. from S of H. A. Holdt Sur. ..... Derrick.

M. T. Beeler's No. 1 Finley and Thomas, 150 ft. from N and 150 ft. from W of 10-ac. lease, C. H. Alexander Sur. ..... Derrick.

Branson et al's No. 1 J. J. Fuller, 1,050 ft. from N and 170 ft. from W of survey, M. Alexander Sur. .... Derrick.

T. J. Connor's No. 1 Forshee estate, 150 ft. from N line and 150 ft. from W line of lease, H. R. Hokit Sur. ..... Waiting on cmt. to set 3,616 ft.

Columbia Oil & Gas Co.'s No. 1-A Harley, 650 ft. E and 300 ft. S of SE cor. of Laura Walker 45-ac. tract, William Robinson Sur. ..... Derrick.

C. R. Starnes' No. 1 G. C. Dunaway, center of Blk. 5, 115 ft. S, 475 ft. W SE cor. H. R. Hokit Sur. ..... Derrick.

D. L. Hoffman's No. 1 Bumpass, 340 ft. from S line and 260 ft. from W line of 10-ac. lease, W. H. Castleberry Sur. ..... Location.

Empire Gas & Fuel Co.'s No. 1 J. T. Jeter, 317 ft. from S line and 150 ft. from E line of D. B. Choate Sur. ..... Waiting on cmt. to set 3,587 ft.

E. E. Fogleson's No. 1 J. B. Doley, 150 ft. from S line and 460 ft. from W line of tract, W. M. Castleberry Sur. ..... Derrick.

Everett et al's No. 1 Barton, center Blk. 6, Mary Van Winkle Sur. ..... Location.

Harris et al's No. 1 J. E. Demoss, center of 1.5-ac. tract, H. R. Holit Sur. ..... Location.

Humble Oil & Refining Co.'s No. 1 H. M. Lawrence, 540 ft. from N and 219 ft. from W of 100-ac. tract, David Ferguson Sur. ..... Derrick.

J. O. Hodges et al's No. 1 G. W. Ritchie, center of S 5 acres of N 10 acres of E 20 acres of Ritchie 40-ac. tract, Wm. Carlton Sur. ..... Location.

Johnston's No. 1 Williams, 125 ft. from N and W of 3-ac. tract, Van Winkle Sur. ..... Drlg. 3,515 ft.

K. B. Oil Co.'s No. 1 Dickson, 150 ft. from S and 150 ft. from W of 5-ac. lease, Mary Van Winkle Sur. S.D. 700 ft.

Kiltner and Easterling's No. 1 Missie Young, 230 ft. S and 250 ft. E of SW cor. of the H. Edwards Sur. in the C. Rhodes Sur. ..... Drlg. 3,550 ft.

M. E. Gaskitt's No. 1 J. A. Godfrey, 320 ft. from S line, 150 ft. from W line of 4.25-ac. lease, M. Dillard Sur. .. Location.

Magnolia Pet. Co.'s No. 1 A. Hicks, 330 ft. from S line, 760 ft. from E line SE cor. of 98-ac. lease, D. Drainwood Sur. ..... Location.

Morgan and McMinn's No. 1 H. L. Foster, 150 ft. W, 15 ft. N SW cor. Magnolia Foster lease, Wm. Painter Sur. ..... Location.

Prairie Oil & Gas Co.'s No. 1 Thomas, 320 ft. from N line and 375 ft. from E line of lease, J. M. Norris Sur. ..... Set 6⅝-in. csg. 3,646 ft. T.D.

Prairie Oil & Gas Co.'s No. 1 W. H. York, 620 ft. from W line and 1,900 ft. from S line of survey, M. Dillard Sur. ..... Waiting on cmt. to set 3,500 ft.

Ross et al's No. 1, located on Findley & Thomas 50-ac. tract, 150 ft. from S line of 6.66-ac. lease, C. H. Alexander Sur. ..... Derrick.

Simplex Oil Co.'s No. 1 J. E. Lawther, 330 ft. from S line and 330 ft. from W line of 36.5-ac. lease, John Moffitt Sur. ..... Drlg. 3,500 ft.

Stanolind Oil & Gas Co.'s No. 1 Nancy Redford, 478 ft. from S line and 462 ft. from W line of 19-ac. tract, John Blair Sur. ..... Waiting on cmt. to set.

Stanolind Oil & Gas Co.'s No. 1 Beulah Jones, 330 ft. S line and 378 ft. from E line of 100-ac. tract, G. W. Hooper Sur. ..... Waiting on cmt. to set 3,552 ft.

Shell Pet. Corp.'s No. 1 A. A. King, 245 ft. from N line, 550 ft. from E line of lease, Geo. A. Thompson Sur... Drlg. 600 ft.

Sun Oil Co.'s No. 1 Calvin Brown, 330 ft. from most southerly S line and middle of E and W lines of lease, L. B. Outlaw Sur. ..... Derrick.

Tom C. Patten's No. 1 George Walter, center of 1-ac. tract and 396 ft. from W line of lease, Mary Van Winkle Sur. ..... Location.

Tidal Oil Co.'s No. 1 Lake Divernia Fish and Game Club, 300 ft. from N and 550 ft. from W lines of tract in William G. Painter Sur. ..... Spudded.

Valentine Oil Co.'s No. 1 Goyne-Hughey, 6,100 ft. from S and 6,800 ft. from W of survey, Mary Van Winkle Sur. ..... Rigging up.

Shasta Oil Co.'s No. 1 L. D. Campbell, 540 ft. from N and 219 ft. from E of 72½-ac. tract, David Ferguson Sur. ..... Set 6⅝-in. csg. 3,601 ft.

HENDERSON COUNTY

Seven Wells Corp.'s No. 1 Douglas, 767 ft. from N and 833 ft. from E of tract in K. H. Douglas Sur. ..... Drlg. 3,615 ft.

HOPKINS COUNTY

Roark et al's No. 1 Taylor, 220 ft. from N and W lines of 80-ac. tract in the John Polk Sur. ..... S.D. 540 ft.

HOUSTON COUNTY

Apex Drlg. Co.'s No. 1 Thompson Bros., 250 ft. out of NW cor. of 200-ac. tract in John Shears Sur. ..... Washing to bottom 2,364 ft.

Ramsland and Ramsland's No. 1 Pennington, 750 varas W of E line and 500 varas from S line of survey on 186-ac. tract, Ramond LaGarza Sur. ..... S.D. 1,653 ft.

C. T. McMamus' No. 1 Harron, 300 ft. out of NE cor. of 327-ac. tract, J. P. Procella Sur. ..... Spudded and S.D. 37 ft.

HUNT COUNTY

Branson et al's No. 1 Gray ..... Location.

Foster and Earl's No. 1 Whitney and Clark, 150 ft. out of NW cor. of 50-ac. tract in W. H. Landrum Sur... S.D. 350 ft.

M. S. Hammond's No. 1 W. H. Adams ..... Location.

M. S. Hammond's No. 1 R. L. Gray ..... Derrick.

Russell et al's No. 1 Brooks and Quattlebaum ..... S.D. 1,455 ft.

LAMAR COUNTY

Indian States Oil Co.'s No. 1 W. T. Watson in Ignalius Aud Sur. ..... S.D. 4,026 ft.

Puritan's No. 1 George Parr, 2,000 ft. from W of Frisco Railway and 1,000 ft. from E line of R. Russell Sur. ..... Rigging up.

LEON COUNTY

Cooper et al's No. 1 Lynch, 4,000 ft. from W line and 250 ft. N from the S line of Thomas H. Gardner Sur., and in 200-ac. tract ..... Preparing to start up; T.D. 1,911 ft.

Sun Oil Co.'s No. 2 Grayson ..... Total depth 5,115 ft.

MORRIS COUNTY

Dumas et al's No. 1 Tom Ball, 1,046 ft. from E and 248 ft. from S of 71-ac. tract, A. S. Young heirs Sur. ..... Derrick.

NACOGDOCHES COUNTY

Bunte et al's No. 1 A. F. Boatman, 330 ft. from S and 150 ft. from W of 67-ac. tract, William A. Moore Sur. ..... S.D. 1,605 ft.

Churchill-Armstrong's No. 1 Max W. Hart, 2,640 ft. from N line and 2,640 ft. from S of N line of survey, George Pollett Sur. ..... Derrick.

G. A. Teague's No. 1 Norris, 60 ft. NW of E line and 420 ft. S of road in 73.5-ac. tract, Hosea Y. Barbo Sur. ..... Derrick.

Gainer et al's No. 1 Nice Well, 18 miles SE of Nacogdoches, 600 ft. from S and 150 ft. from W of Wells tract in A. Cherino Sur. ..... Shut down 3,430 ft.

Joiner and Henson's No. 1 Andy Legg, 330 ft. from N and 330 ft. from W of tract, John Durst Sur. ..... S.D. 3,920 ft.

Scully & Harwell's No. 1 R. I. Driver, 1,500 ft. from SE cor. of P. B. Ballard 125-ac. tract, 15 miles SE of Nacogdoches in Patricia De Torres Sur. ..... S.D. 3,035 ft.

Taylor-Vaughn's No. 1 Dixon Greer, 160 ft. from W and 450 ft. from N lines of 60-ac. tract in the M. G. Horrera Sur. ..... Shut down 265 ft.

Creighton Drlg. Co.'s No. 1 J. N. Stewart, center of 79-ac. tract in the Jose Ignacio Ybarbo Sur. ..... S.D. 2,335 ft.

RAINS COUNTY

Berry and Hale's No. 1 Ownsby, 150 ft. N and 1,100 ft. from E of most easterly SE cor. of survey, Alexander Sur. ..... Drlg. 2,175 ft.

RED RIVER COUNTY

Doyle and Jondreau's No. 1 V. S. Griffin, 700 ft. from N line and 650 ft. E of W line of survey, J. C. Brown Sur. ..... Slush pit.

Droppleman and Bundy's No. 1 J. W. Cunningham, 250 ft. from the S and 1,066 ft. from the E lines of B. M. Ballard Sur. ..... Rig up.

Harris & Joiner's No. 1 E. Howison, 225 ft. S, 185 ft. W of 79-ac. tract, William Humphreys Sur. ..... Shut down 1,940 ft.

Concord Oil Co.'s No. 1 J. R. Dellahunty, 500 ft. from N of Isaac Moore Sur. and 200 ft. E of E line of Robert Glass Sur. ..... Drlg. 1,026 ft.

ROCKWALL COUNTY

Bucanner Oil Co.'s No. 1 H. L. Lofland, center of 69-ac. tract in W. M. Bird Sur. ..... Set 10-in. csg. 120 ft.

RUSK COUNTY

Barney Cockburn's No. 1 Nathan Green, 330 ft. from S and E line of lease, M. Husner Sur. ..... Drlg. 2,400 ft.

Chapman's No. 1 W. M. Futch, 330 ft. from N line and 500 ft. from E line of survey and lease, Jos English Sur. ..... Waiting on boilers.

Griffith Bros.' No. 1 S. E. Brox, 330 ft. from N and W lines of 30-ac. tract, Thomas Grace Sur. ..... Drlg. 1,500 ft.

Humble Oil & Ref. Co.'s No. 1 Ben Peterson, 453 ft. from N line, 330 ft. from W line of N line and 330 ft. from W line of 50-ac. lease, J. Lewis Sur. ..... Derrick.

Noel Rushing et al's No. 1 Geo. Thompson, 700 ft. from N line and 600 ft. from W line of lease and survey.. Rigging up.

Weaver and Crim's No. 1 Bean, 330 ft. from S line and midway between E and W lines of lease, H. Hobson Sur. ..... Derrick.

Tex-Jersey Oil Corp.'s No. 1 G. W. Eaton, center of 1.54-ac. tract, F. Cordova Sur. ..... Drlg. 1,700 ft.

Carl G. Willie's No. 1 Joe Lee, old well being drilled deeper, 330 ft. from S and E line of 50-ac. tract, Geo. Berry Sur. ..... Drlg. 3,805 ft.

KILGORE AREA—RUSK COUNTY

Harry Elliott's No. 1 Carroll, 175 ft. from N and 200 ft. from E of 7-ac. tract, W. R. Cooke Sur. ..... Location.

Raitman's No. 1 W. P. Moore, 240 ft. from S and 330 ft. W of NW cor. of W. P. Moore 25-ac. lease, H. Wiggins Sur. ..... Drlg. 2,800 ft.

JOINER POOL—RUSK COUNTY

Armstrong's No. 1 Alford, 151 ft. from S and 1,080 ft. from W of survey, T. J. Moore Sur. ..... Derrick.

Astnon's No. 1 Alford, 280 ft. out of NE cor. of 11-ac. lease, H. H. Penny Sur. ..... Top sand 3,663 ft.; prepare to complete.

C. M. Johnson's No. 1 Griffin, 539 ft. from N line and 115 ft. from W line of lease, J. B. Cadena Sur..... Drlg. 3,485 ft.

Duncan and Holt's No. 1 R. A. Motley, 150 ft. from N line, 2,700 ft. from W line of Motley 100-ac. tract, F. Cordova Sur. ..... Location.

Humble Oil & Refining Co.'s No. 1 Moranda Joyner, 330 ft. from N and W lines of lease, F. Cordova Sur... Location.

Humble Oil & Ref. Co.'s No. 1 Jessie White, 330 ft. from S line, 330 ft. from W line of 42-ac. tract, James Scott Sur. ..... Location.

Jackson et al's No. 1 P. C. Warrne, 390 ft. from N line, 253 ft. from E line of 45-ac. tract, J. Womack Sur...Location.
M. & G. Oil Co.'s No. 1 Lewis Deguerin, 1,050 ft. from E line, 3,075 ft. from S line of survey, M. J. Pru Sur. ....Moving in material.
Magnolia Pet. Co.'s No. 1 S. E. Brox, 330 ft. from N and W lines of most northerly NW cor. of 84.5-ac. lease, Geo. Cooper Sur. ....Derrick.
Mass and Tucker's No. 1 Matthews, 3,244 ft. from N, 4,356 ft. from E, Dalines Cartimas Sur. ....S.D. 3,350 ft.
Paulett et al's No. 1 Ed Sparks, 350 ft. from E, 150 ft. from S of survey, L. C. Riggs Sur. ....Waiting on cmt. to set 1,313 ft.
Pitts et al's No. 1 Freeman, 1,000 ft. N of S line and 1,000 ft. E of W line of 181-ac. tract, J. Watkins Sur. ....Rig blew down.
Priest et al's No. 1 Mayfield, 155 ft. from N and W lines of 22-ac. lease in Daniel Clark Sur. ....Drlg. 3,000 ft.
Sullivan & Burch et al's No. 1 F. J. Cox, 330 ft. from S line and 330 ft. from W line of tract, R. H. Penny Sur. ....Drlg. 2,500 ft.
W. W. Hinchliffee's No. 1 L. J. Pinkston, 330 ft. from E line and center of N and S lines of lease, J. B. Cadena Sur. ....Derrick.

SMITH COUNTY

Bunte et al's No. 1 Atkinson, 1,000 ft. from S line and 1,000 ft. from N line of 330-ac. tract, Calloway Dean Sur. ....Derrick.
Cotton Belt Oil Co.'s No. 1 C. S. Jackson, 500 ft. from N and 500 ft. from W of 39.85-ac. tract, Henry Mickleborough Sur. ....Coring 4,030 ft.
Sinclair Oil & Gas Co.'s No. 1 Jack Wiley, 150 ft. from S and W lines of lease, James Jordan Sur. ....Set csg. 131 ft.
Tytex Oil Co.'s No. 1 Alex Weldert, 2,030 ft. from S line, 525 ft. from E line of Franklin T. Bodenheimer Sur. ....Derrick.

TITUS COUNTY

Perry V. Cook's No. 1 M. C. Rogers, center of SW of Moore Sur. ....S.D. 2,603 ft.
Joiner et al's No. 1 Clayton Brown, 1,300 ft. from E and 400 ft. from most northerly S line of V. Evans Sur...S.D. 2,250 ft.
J. P. Flannagan's No. 1 McGill, 450 ft. from S and 662 ft. from W of H. C. Riggs Sur. ....S.D. 6,640 ft.

UPSHUR COUNTY

Cal Petroleum Corp.'s No. 2 W. F. Glynn, 909 ft. from S line and center of E and W lines of tract, G. W. Hooper Sur. ....Waiting on cement.
Cal-Tex Corp.'s No. 1 Taylor, 350 ft. N and E of SE cor. of Hargrave lease, Marshall Mann Sur. ....Set 6⅝-in. csg. 3,590 ft; waiting on cmt. to set.
Calhoun et al's No. 1 J. R. Penn, 265 ft. from S line and E line of Penn 104-ac. tract, Joseph Manning Sur. ....S.D. 3,718 ft.
Cal Pet Corp.'s No. 1 W. H. Reed, 330 ft. from S and E line of 50-ac. lease, Marshall Mann Sur. ....Location.
Cole and Butler's No. 1 D. F. Guest, 300 ft. out of NE cor. of Guest 129-ac. tract and survey ....Derrick.
Cranfill & Reynolds' No. 1 Milton Rash, 1,687 ft. E of W line and 330 ft. N of S line of Rash estate, E. N. Eubanks Sur. ....Topped Pecan Gap 2,418 ft.; drlg. 2,810 ft.
Eastland Oil Co.'s No. 1 O. M. Victory, 330 ft. from S line and 500 ft. from the W line of survey, E. A. J. Evans Sur. ....Top sand 3,640 ft.; T.D. 3,642 ft.
Glasscock et al's No. 1 T. Wells, 250 ft. from N line of survey and 1,300 ft. from W line of farm on gin site tract, G. W. Hooper Sur. ....Rigging up.
Moncrief Showers' No. 1 Collins, 90 ft. from N line and 90 ft. from W line of lease, G. W. Hooper Sur. ....Waiting on cmt. to set, 3,678 ft.
Humble Oil & Refining Co.'s No. 1 J. Phillips, 330 ft. from N line and 330 ft. from W line of lease, H. Edwards Sur. ....Top sand 3,644 ft.; T.D. 3,649 ft.
Humble Oil & Refining Co.'s No. 1 C. T. Shelton, 330 ft. from W line of S 59-ac. tract and 369 ft. from S line of survey, William King Sur. ....Derrick pattern.
Humble Oil & Ref. Co.'s No. 1 D. C. Shelton, 273 ft. from E of W line, 150 ft. N of S line of 19.5-ac. lease, Wm. King Sur. ....Derrick.
Lewis Sikes et al's No. 1 H. Mayers, 330 ft. from W line and center of N and S lines of 25-ac. lease, A. T. McGee Sur. ....Location.
J. L. Roberts' No. 1 Anna L. Jenkins, 330 ft. from E line and center of N and S lines of 37.5-ac. tract, H. Edwards Sur. ....Drlg. 3,140 ft.
Sun Oil Co.'s No. 1 T. C. Raney, 250 ft. from S line and 200 ft. from W line of lease ....Drlg. 3,424 ft.
Treco Oil Co.'s No. 1 A. D. Adkins, center of 6-ac. lease in the William King Sur. ....Testing 3,765 ft.
Smith Bros.' No. 1 J. W. Davis, 400 ft. from N and 800 ft. from W lines of S 200 acres of J. W. Davis 330-ac. tract in John Burleson Sur. ....Set 10-in. at 97 ft.
W. H. Peckam's No. 1 J. B. Well, 200 ft. N and 489 ft. W of SE cor. of W 20 acres of 71-ac. tract, G. W. Hooper Sur. ....Drlg. 1,620 ft.
Wolf's No. 1 Cook, center of 115-ac. tract in Jacob Walker Sur., 5 miles W of Rosewood ....Shut down 1,100 ft.

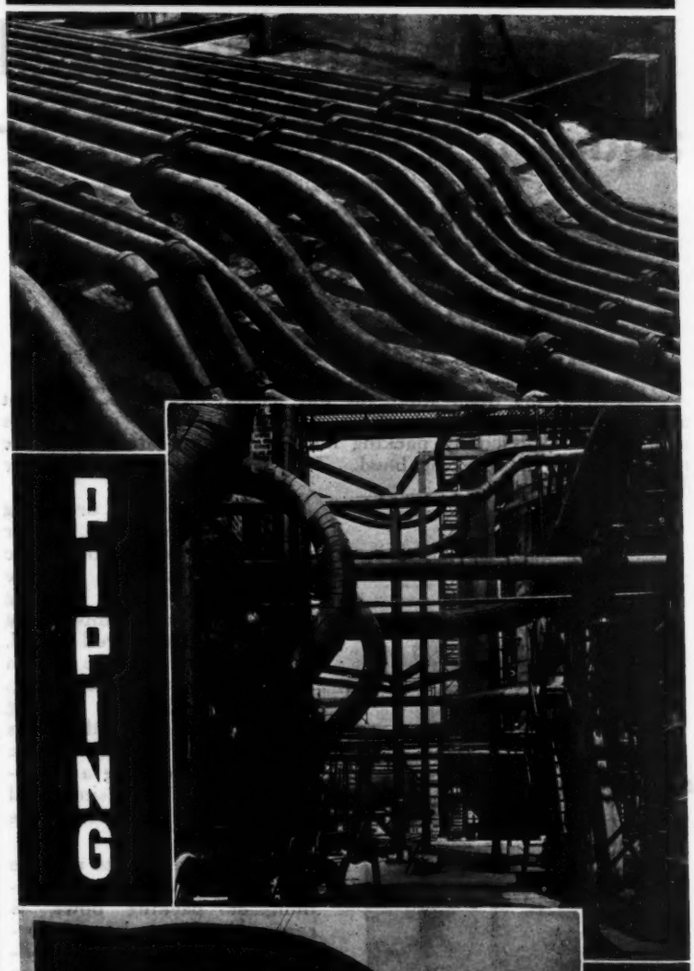
VAN ZANDT COUNTY

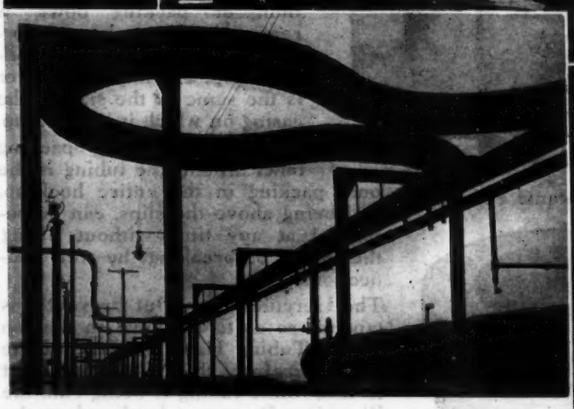
Barton et al's No. 1 C. L. Hubbard, 600 ft. out of NE cor. of Hubbard 225-ac. tract, 3½ miles S of Canton, M. J. Cadena Sur. ....S.D. 2,000 ft.
Kelly Oil & Gas Co.'s No. 1 Lemsford, center of Lemsford tract, John Conner Sur. ....S.D. 2,300 ft.
W. P. Palmer et al's No. 2 W. P. Forster, 600 ft. from N and 450 ft. from E of SW cor. of Forster 151-ac. tract in the F. Montgomery Sur. ....S.D. 3,160 ft.
Pure Oil Co.'s No. 4 W. A. York, 830 ft. W of E line and 660 ft. S of N line of W. A. York 50-ac. tract, John Walling Sur. ....Preparing to set csg.
Van Oil Association's No. 1 Tankersley, 200 ft. from E and 1,000 ft. from S of farm, L. Landers Sur. ....Total depth 2,761 ft.
Pure Oil Co.'s No. 1-T V. T. Davis, 400 ft. N of N line of Tunnell No. 8 lease, 480 ft. W of E line of Sur., Nacogdoches County School Land Sur. ....Reaming to straighten hole 3,605 ft.
Pure Oil Co.'s No. 4 J. A. Bracken, 735 ft. E of W line and 782 ft. N of S line of lease in John Walling Sur...Casing 2,782 ft.
Pure Oil Co.'s No. 7 R. A. Tunnell, 733 ft. E of W line and 711 ft. S of N line of lease in John Walling Sur...Drlg. 2,845 ft.
Pure Oil Co.'s No. 13 R. L. Wells, 200 ft. N and 695 ft. E of NE cor. of Mary P. Nells' 100-ac. lease, Mund Gross Sur. ....Coring 2,868 ft.
Pure Oil Co.'s No. 3 H. C. Gilbert, 856 ft. E of W line, 225 ft. N of S lines of lease, Mund Gross Sur. ....Location.
Pure Oil Co.'s No. 6 N. E. Clark, 696 ft. E of W line, 200 ft. S of N line of lease, Mund Gross Sur. ....Location.
Pure Oil Co.'s No. 8 A. R. Tunnell, 741 ft. E of most westerly west line, 638 ft. N of S line of lease, John Walling Sur. ....Location.
Pure Oil Co.'s No. 2 Frank Blackstock, 150 ft. S, 150 ft. E of NW cor. lease, John Walling Sur. ....Location.
Sun Oil Co.'s No. 5 I. W. Thompson, 200 ft. S of N line, 250 ft. W of E line of lease, John Walling Sur...Location.
The Texas Co.'s No. 2 J. A. Bracken, 683 ft. N of S line and 250 ft. E of W line of lease in John Walling Sur. ....Drlg. 2,665 ft.

WOOD COUNTY

Brennan and Wood's No. 1 L. W. Mings, 300 ft. from NW cor. of survey and tract, Moses Stripling Sur....Derrick.

YEARS OF EXPERIENCE





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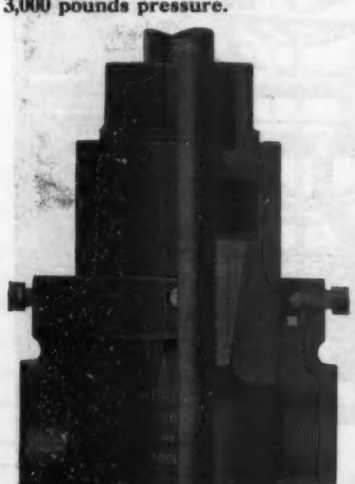
New
Hercules Tubing Head and Blow-out Preventer

This new Hercules equipment is said to be the most economical Tubing Head for permanent well hook-ups.

As shown in the illustration, the top section has three slips that are used to support tubing—packing rings rest on top of the slips and are compressed by packing nut for packing off around the tubing within the packing bowl. This tubing head is tested for 3,000 pounds pressure.



Patents Pending

The lower section, or casing head, is the same as a regular casing head with two 3" side outlets. However, for the purpose of fitting packing bowl, in the top of this casing head there is a tapered thread, the same size as in the bottom that screws on to the casing. The top section, or packing bowl, is threaded and screws into the top thread in the casing head, forming a watertight joint. The casing head also is tested for 3,000 pounds pressure.

When it is desired to run the tools into the well, the top section, or packing bowl, is removed and you have an ordinary casing head with oil-saver top. The inside diameter is the same as the size of the casing on which it is made up.

The packing in the packing bowl around the tubing is the only packing in the entire hook-up, and being above the slips, can be repacked at any time without lifting the tubing or breaking the well connections.

The Hercules Blow-Out Preventer is tapered so as to fit down in the top of the Tubing Head in place of the slips, therefore, should the well start to flow while tubing is being run, the Blow-Out Preventer is placed on the tubing, and the tubing lowered until the collar on the tubing rests on the Blow-Out Preventer.

The Hercules Tubing Head is simple, yet complete and serviceable, and is the most economical Tubing Head for permanent well hook-ups in all fields.

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Study Extreme-Pressure Lubricants

Friction at High Loads a Function of Type of Bearing Metals as Well as Oil. Sulphur Helps to Reduce Wear

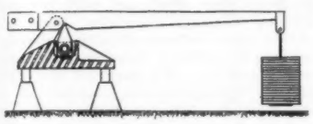
By H. C. Mougey and J. O. Almen
General Motors Corp., Detroit, Mich.*

In the case of gears in rear axles of automobiles, in general, it has been found that there are several distinct types of failures that are met with in service. The most important of these are:

1. Failure of gear teeth by breakage, which is strictly fatigue failure of the material, and is in no wise connected with lubrication. Such failures can be remedied by strengthening the design and by improvements in materials and heat treatment.

2. Failure of gear teeth by pitting. This also is a fatigue phenomenon, and lubrication has little effect. This condition can be remedied by improvements in design, material, and heat treatment.

3. Scoring or galling of gear teeth. This failure is probably a condition of actual welding of small areas of the mating teeth due to high pressures and high instantaneous temperatures. Improvements in surface hardness of the teeth will be partially effective in preventing scoring; but if full use is to be made of the known improvements that can be made in resistance of gear teeth to pitting and breakage, it is probable that the hardest obtainable surface will be insufficient to prevent scoring.



Complete Assembly
Figure 1

Scoring Sets Limit on Loads

It appears, therefore, that we may expect tooth scoring to set the limit on the loads that may be transmitted through gears, and it is for this reason that the General Motors Research Laboratories have been actively engaged, during the last four years, in studying the properties of high-pressure lubricants.

We are accustomed to think of lubrication as a condition in which a film of oil prevents the rubbing surfaces from coming into contact with one another, and thus prevents wear. That this condition actually exists in well-lubricated bearings is well known; but it is not so well understood that this conception of lubrication does not apply to highly loaded gears. In well-lubricated bearings the loads rarely exceed 2,000 pounds per square inch projected area, and the rubbing speeds are generally high enough to maintain a film of oil which separates the bearing and journal. In automobile gears, the pressure between gear teeth reach values as high as 400,000 pounds per square inch, with rubbing velocities ranging from zero to 300 feet per minute, and this between convex curvatures which are poorly adapted to maintain a lubricating film. It is inconceivable that even the most viscous oils and greases can be retained between the surfaces of the teeth in a sufficiently thick film to prevent metallic contact, particularly when it is realized that the operating temperatures of over 210° F. are common. With these conditions prevailing, it is not difficult to imagine that we are fast approaching the limit of capacity of ordinary oils. The fact that we are not now in difficulties can probably be attributed to the intermittent nature of the loading which permits time for temperature equalization between periods of load.

Needs of "Hypoid" Type Gear

A type of rear axle gear known as hypoid has been on the market for a number of years, and with such gears it has been found necessary to use special lubricants. This is not because the hypoid design carries higher loads than the spiral bevel gear; but the difference is simply a question of rubbing velocity, which in the hypoid design is somewhat higher than in the spiral bevel design. Since scoring is due to a combination of load and speed, with consequent high temperatures, it follows that, for equal loads, the scoring conditions will be reached in the hypoid design earlier than in the spiral bevel types of gears. However, it is only a matter of relatively slight changes in gear dimensions before the spiral bevel gear will also be in scoring difficulties. Even now it is possible to score conventional spiral bevel gears under extreme conditions of inertia load such as can be developed by use of the modern fast shifting transmissions.

Since it was improbable that any ordinary oil or grease was capable of maintaining a fluid film between gear teeth, an investigation was directed toward the problem of preventing galling or scoring between heavily loaded sliding surfaces. This work was originally done on complete rear axles in a dynamometer setup, in which it was possible to reproduce conditions of seizure between the differential pinions and pin identical with service failures that were at that time occasionally found in certain districts. This was done by locking one wheel and taking the load through the differential. This test, however, was slow and expensive. A special machine was, therefore, built which approximated the essential parts of the axle test, i.e., a hardened steel pin rotated in hardened steel bushings, the assembly being immersed in the oil to be tested. The details of this machine are shown in Figure 1. The bearing assembly is immersed in an oil bath. The journal is then rotated by means of a dynamometer from which the torque required to rotate the journal can be determined.

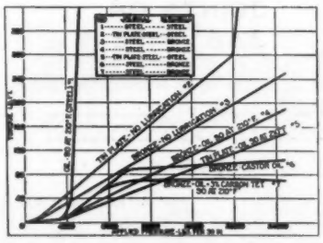


Figure 2

Testing Machine Described

The usual method of operating this machine is to rotate the journal at 100 r.p.m. with a constantly increasing load of 1,000 pounds per square inch projected area applied every 10 seconds until a total load of 25,000 pounds per square inch is reached or until seizure occurs. In operating this testing machine, it was found that when we made tests with ordinary lubricants with steel against steel, at certain loads and speeds, seizure or scoring resulted; but it was also found that seizure could be prevented if another metal was substituted for steel as one of the wearing surfaces, for example, steel against bronze. Tests established that there are a number of metals and alloys that could be substituted for bronze and operated against steel, and still avoid the difficulties that occur with steel against steel; but there is the objection to most of these metals that they are low in strength and are not suitable as gear materials. We found that by means of electroplating different metals on steel we could get the benefit of the wearing surfaces of the plated metal and the strength of the steel backing. We also found that by mixing finely divided metal powders with the oil we could get the same results as if the metals had been plated on the bearings, with the exception, however, that we could not keep these powders in suspension for any length of time. Very much to our surprise it was found that we could operate steel against bronze and certain other metals with no lubricant whatever using loads and speeds that would result in seizing or scoring, if we used steel against steel with ordinary oils or greases.

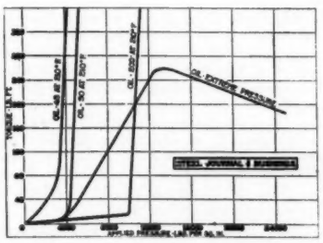


Figure 3

In Figure 2 curves are shown of tests in which steel journals were operated against steel, bronze or tin plated steel with no lubricant whatever or with various lubricants. In this figure, the vertical lines on the test of steel on steel with mineral oil and with the tin-plated journal dry indicate seizure of the journal and bushing. The others completed the test without seizure.

"Extreme-Pressure" Lubricants

There remains a serious objection to the use of plated metals for highly-loaded moving parts in that, if the plate should be worn off in service, the steel would then operate against steel with unsatisfactory results. If a lubricant could be developed which would form on the surface of the steel a film or plate with a low coefficient of friction, similar in effect to that of the film or plate of electro-deposited metal, and if this film or plate would be reformed automatically as it is worn off in service, this might be a solution of the problem. We believe that some phenomenon enables the so-called "extreme-pressure" lubricants to operate. In Figure 3 are shown results obtained with three ordinary mineral oils and one commercial "extreme-pressure" lubricant. The mineral oils have viscosities of 48, 90, and 200 at 210° F., respectively. The "extreme-pressure" lubricant has a viscosity of approximately 90 at 210° F. It will be noted that viscosity effect is quite marked, in that the 200 viscosity oil shows a low friction up to 10,000 pounds per square inch, at which point the oil film fails with a consequent rapid rise in friction, and that the oil films with the lower viscosity oils, as would be expected, fail at much lower loads. Since the initial oil temperature in these tests was about 70° F., it is evident that in service where temperatures of 200° F. are common, even the heaviest oils are incapable of sustaining very high loads. The heaviest oil shown in Figure 4, if heated before the test to 200° F., thus reducing the viscosity, will give results similar to an ordinary engine oil tested cold. In the case of the "extreme-pressure" lubricant, the curve indicates it behaves exactly like any ordinary oil so long as the oil film is maintained.

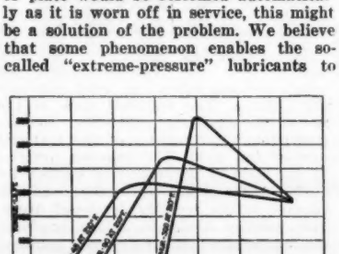


Figure 4

The addition of other materials to the oil does not affect the characteristics until the oil film has failed, whether the oil be light or heavy; but at higher loads there is a sudden transition from one friction level to another. These results indicate that lubrication at this higher level is accomplished by some medium having properties different from oil as used in ordinary film lubrication.

Sulphur Is Active Ingredient

In Figure 4 are shown three oils with viscosities of 48, 90, and 300 at 210° F., respectively; but these oils have all been sulphurized. It will be noted that in the "extreme-pressure" region the friction is approximately the same for all three oils, but an interesting difference occurs in the transition region in that the maximum friction is least for the light oil and greatest for the heavy oil. However, by reducing the viscosity of the heavy oil by the addition of light oil or kerosene, the point of maximum friction can be lowered. We believe this indicates that the film which carries the load in the "extreme-pressure" lubricant region is caused by chemical action requiring heat, and that this high friction shown by the heavy oil results from the layer produced by chemical action not having enough time to form before it is required to carry the load. For a number of years, lead-soap lubricants have had the reputation of carrying higher loads than ordinary mineral oil lubricants. We tested in our laboratory commercial lead-soap lubricants, and found that some of them had this superior load-carrying ability and that others did not. In trying to find the reason for this difference, we analyzed and tested many commercial lead-soap lubricants, and made and tested many others. Very early in our work we found the presence of large amounts of sulphur in the successful lead-soap lubricants, with usually much smaller amounts of sulphur in the ones which did not carry the extreme loads. This, together with the knowledge that flowers of sulphur has long been used to overcome overheated bearings, and that sulphur oil is extensively used in cutting lubricants, suggested that sulphur was the active ingredient in successful lead-soap lubricants. We made experimental mixtures where we added sulphur to mineral oils

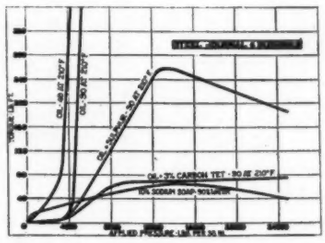


Figure 5

*Presented at American Petroleum Institute meeting, Chicago, November 12, 1931.

low in sulphur, and found that by this addition the oil was able to carry the heavy loads, whether lead soap was present or not. We added lead soap to mineral oils low in sulphur, but we were never able by this means to improve the load-carrying ability; although in some cases, when we added lead soap to oils which were high in natural sulphur, we obtained superior load-carrying properties.

Lead soap added to sulphur-free mineral oil does not seem to increase its load-carrying ability, but lead soap added to pure castor oil does make an "extreme-pressure" lubricant which works effectively beyond the range of castor oil. Lead soap added to a mineral oil containing enough sulphur produces an "extreme-pressure" lubricant that seems to make the transition from "fluid-film" lubrication to "extreme-pressure" lubrication with less friction and heat than a sulphurized mineral oil without the lead soap or other materials which might help in the transition range.

Castor Oil Similar to Sulphur

In testing these lubricants, we found that when these successful lead-soap lubricants were operated under conditions where mineral oil without these additions could not carry the loads, in all cases except that of castor oil plus lead soap, the surfaces of the steel were covered with a black film, which analysis indicated to be iron sulphide. In the case of castor oil plus lead soap, we believe the acids in the castor oil have an action similar to that of sulphur. These investigations indicated that the superior load-carrying properties of "extreme-pressure" lubricants were due to the formation of a separating film not of oil but of some material formed directly on the surface of the steel. This theory is similar to that which is held by many investigators seeking to explain the peculiar oiliness properties of animal and vegetable oils and mixtures of these with mineral oils. If this were true, it would be necessary for an oil to contain chemically active material to function as an "extreme-pressure" lubricant, and it seemed likely that other materials than sulphur should have similar properties. To test this theory, we went to the chemical stock room and selected a large number of chemicals, and tested them as lubricants for extreme-pressure conditions. We found certain esters, such as benzyl benzoate, dibutyl phthalate, etc., which have chemical structures more or less analogous to animal and vegetable oils, which gave lubricating results in our tests comparable to animal and vegetable oils. In general, this type of material will give a lower coefficient of friction than ordinary mineral oil when tested under conditions that are slightly too severe to permit the operation of a mineral oil, but it usually fails to carry the real extreme pressures.

Among the most interesting of the materials that may be used to increase the load-carrying capacity of lubricants is chlorine in various forms, such as carbon tetrachloride, etc. When such material is added to ordinary oil in quantities from 1 per cent up, the test results are quite startling, as shown in Figure 5. In testing some of these compounds, we found that iron chloride was formed on the surface of the steel; and it is our belief that the superior load-carrying ability of these chlorine-containing materials is due to their action in forming iron chloride on the steel, which apparently acts as a separating film capable of sustaining extreme loads. A striking example was the case of dichlarethyl ether. This is a very fluid material of about the consistency of gasoline. It boils at 349° F. (176° C.), and from its physical appearance it certainly would not be selected as a high load-carrying lubricant. In our tests, this material, in its undiluted state, was found to be equal to the best "extreme-pressure" oil or grease ever tested by us in its load-carrying ability and low friction characteristics; and at the completion of the test small amounts of iron chloride could be scraped from the container in which the test was made, although the steel wearing surfaces appeared to be unaffected, and as smooth and bright as when the test was started. This test appeared to demonstrate that the viscosity of the lubricating oil is of little importance as regards its load-carrying ability in the extreme-pressure region. Tests of commercial lubricants have shown that there are on the market a number of lubricants for which great claims are made and which contain various chlorine compounds.

Sodium Oleate Makes a Good Lubricant

One of the best lubricants tested was a 10 per cent solution of soap (sodium oleate) in water. This material gave a lower friction and a better appearing journal at the end of the test than any other lubricant we have tested. The results of this test are shown in Figure 5. In contrast to this, the same amount of sodium soap added to mineral oil, and subjected to the same test, gave results comparable to ordinary mineral oil of high viscosity. These tests emphasize the importance of the body of the lubricant as a cooling medium as well as that of a carrier of the chemically active material. Since high-pressure lubricants appear to act chemically, care should be used to select such materials as will be active when needed, but not corrosive or active when they are not required to develop this property. Too much attention should not be paid to empirical laboratory tests to determine these properties. There has been a wide commercial use of sulphur-containing lubricants, especially those used for cutting oils; and yet it would be easy to develop laboratory tests that would indicate such sulphur-containing lubricants would be dangerous from a corrosive standpoint. Attention should also be called to the fact that under conditions where ordinary mineral oil is satisfactory, such as fluid-film lubrication, it is usually impossible to show any improvement due to the addition of these chemically active materials. In addition, a lubricant may be an "extreme-pressure" lubricant when used with one combination of metals and under certain conditions, and yet it may be only an "ordinary" lubricant, or worse, when used with other combinations of metals or under other conditions.

Chemical Action of Lubricants

If this theory of chemical action of the lubricants on the surface of the steel is correct, then there is a possibility of undesired chemical action in some cases. As a general rule, the manufacturers of ball and roller antifriction bearings have been opposed to the use of these special lubricants, particularly the lead-soap lubricants, on account of their belief that they decrease the life of ball and roller bearings. It is evident that it would not be a solution to the problem to develop lubricants that would lubricate gear teeth and cause failures of the ball and roller bearings, and a lubricant in order to be satisfactory must operate both with the gear teeth and with the antifriction bearings. However, tests have shown that extreme-pressure lubricants are not of necessity injurious to ball and roller bearings; and, therefore, this whole subject requires careful consideration on the part of both the lubricant makers and the bearing makers.

Only Service Data Reliable

We feel that in all this work great care should be used in interpreting results obtained with any laboratory testing machine or method. The lubricants are not made to lubricate testing machines but rather to lubricate gears and bearings in actual service; and only actual service data, or data that can be related to service, should be used. In operating the test machine developed in our laboratory, we have found that by varying the speed of rotation of the pin or by varying the rate at which the load is increased, we can develop contradictory results. This is probably also true of all laboratory test equipment now in use. Before a testing procedure could be decided upon, we found it necessary to determine the properties of these lubricants by actual service data; and until this was done we could not establish the relative merits of any of the lubricants tested. It makes no difference if the laboratory testing equipment consists of an actual set of gears in a transmission or an axle or whether the test is conducted in a car or on a test fixture. The conditions of load and speed, if arbitrarily selected, may not be representative of service conditions; and results of such tests are,. therefore, not reliable unless they are checked by actual service.

There is a large potential market for "extreme-pressure" lubricants; but before this market can be developed, certain factors must be recognized and difficulties introduced by them overcome. The large automobile companies cannot put out designs requiring special lubricants until the oil industry generally is in a position to supply them and until tests are developed by which the satisfactory lubricants can be distinguished from the unsatisfactory ones. As previously mentioned, roller and ball bearing companies at the present time are opposed to extreme-pressure lubricants as a class, as they maintain that they cause rapid wear on roller and ball bearings. Until this situation is cleared up, the large automobile companies cannot take advantage of the extreme-pressure lubricants. It is evident that until designs calling for extreme-pressure lubricants are produced and distributed in quantity, the volume of business in extreme-pressure lubricants for automobiles is necessarily limited. The problems that are involved are too great to be solved in any reasonable time by any one individual or company, but will require the co-operation of all industries affected.

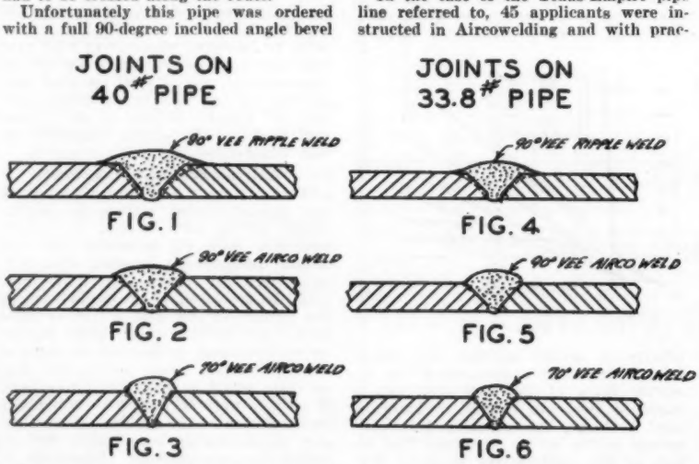
NEW PIPE LINE WELDING METHOD EMPLOYED ON TEXAS-EMPIRE LINE

By W. R. Ost
Air Reduction Sales Co.

The gas welding of a pipe line for carrying oil or gas is more history now than news. Nevertheless when the welding of a line can be dispatched to allow the same size welding crews to double its output per day, then the event, constructing the line, becomes news. The welding of Section 5 of the Texas-Empire line from Longview to Port Arthur, Tex., was done by the Aircoweld method in about one-half the time ordinarily required by the crews employed.

The section welded was approximately 44 miles long, made up of four different makes of 12-inch pipe. The pipe came in random lengths and in weights of 40 pounds per lineal foot and 33.8 pounds per lineal foot. The right of way was over a rolling terrain, passing through cotton fields and woods. Numerous roads, pipe lines, creeks and the Sabine River had to be crossed along the route.

Unfortunately this pipe was ordered with a full 90-degree included angle bevel which did not allow the most economical welding. The included angle of the vee of the pipe joint will effect directly proportionate economies of the material cost of the weld. The growing practice in the field is to employ a smaller included angle in the vee, taking full advantage of the recently developed acetylene welding technique which produces the best results with the smaller included vee.



Upon final analysis welding on pipe line resolves itself into a production job. The problem is to organize a balanced welding crew of tack welders, firing line welders and tie-in welders which can handle with the least loss of time the number of welds to be made, which must be determined by the conditions to be met by the line-up crew.

The use of the Aircowelding technique will allow a considerable reduction in the cost of the welding operations, which should be reflected in the prices quoted by contractors, if the work progresses at a uniform rate with a balanced organization. The savings made possible by the increased speed of welding can be minimized by improper handling of the correlating operations, such as clearing the right of way, stringing the pipe, lining up the pipe, etc., so that careful study of these operations must be made if these savings are to be enjoyed.

Aircowelding in contrast to the orthodox puddle or ripple method differs in the following principles:

1. A smaller vee is possible and desirable.
2. The sides of the vee are not melted or broken down to the same degree as formerly.
3. The Aircoweld simplified method with Aircoweld No. 3 rod produces small welds that will consistently develop the full strength of the pipe.

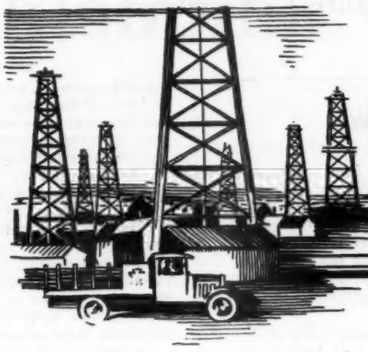
Any welding technique to be of practical value in the field must by necessity be simple and one that can be applied by the average welder.

In the case of the Texas-Empire pipe line referred to, 45 applicants were instructed in Aircowelding and with practice of from one hour to four hours all applicants, succeeded in making the welds from which test coupons were taken, and with one exception the welds made developed the strength of the pipe. Throughout the entire job only 33 of these applicants were put on the pipe line and this included the usual replacement of "drag-ups." Therefore, the fact that Aircowelding is well within the skill of the average welder, was definitely determined.

What Is Aircoweld'ng?

The economy and quality of the welds put into this line, reflect the development of the simplified Aircoweld method which took full advantage of the corresponding development of the Aircoweld No. 3 rod. The economies effected as the result of a simpler and faster technique, as developed by the Air Reduction Sales Co. Laboratories, followed by a number of field demonstrations and jobs, will allow the pipe line companies to continue to enjoy the advantages of gas welded lines at even lower cost. The superiority of Aircoweld method can be attributed to the special characteristics of the welding flame, the metallurgical properties of the

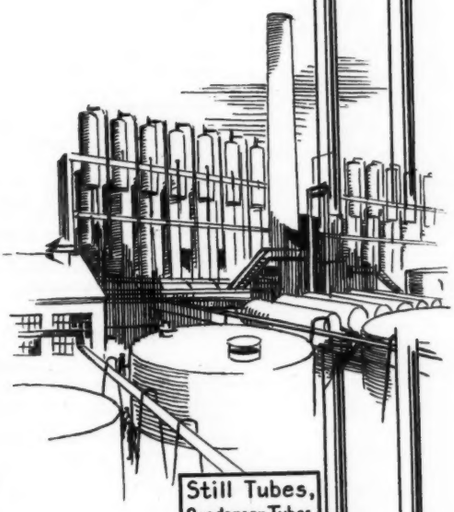
(Continued on Page 114)



Casing, Drill Pipe, Oil Well Tubing

Oil Line Pipe

From the Sand to the Consumer through



Still Tubes, Condenser Tubes, Refining Pipe

Pittsburgh Seamless PIPING

Gasoline Line Pipe

Prompt deliveries from complete stocks at Memphis storage yard

PITTSBURGH STEEL PRODUCTS COMPANY

Pittsburgh New York Houston Pittsburgh Steel Co. Chicago Detroit St. Louis Tulsa

Dividends from Fundamental Research

Institute's Scientific Program Has Shown Fallacy of Past Assumptions. Lays Groundwork for Future Expansion

By J. Bennett Hill
Atlantic Refining Co.*

Since petroleum consists principally of hydrocarbons, and since these are the basic raw materials which petroleum offers, the first obvious need for fundamental research is a determination of what types of hydrocarbons are contained in petroleum and how these hydrocarbons behave. A survey of what has come from institute projects along these lines brings out many interesting points. An exhaustive and painstaking piece of work,[a] on the determination of the types of hydrocarbons which are present has been undertaken, and is still in progress. The work has been done on a northern Oklahoma petroleum as an average crude, since it has been felt that the differences in the individual hydrocarbon contents of different crudes would be quantitative but not qualitative, and that the compounds present in such a crude would be present in greater or lesser quantities in other types of crude. The most surprising fact revealed by this work is the comparatively small quantity of the straight-chain paraffin hydrocarbons in the naphtha fraction, whereas it has been generally believed that a naphtha as paraffinic as this consisted principally of this class of compounds. For example, all but one of the branched-chain hexanes are present and, even more surprising, there is present nearly as much of the aromatic hydrocarbon toluene (the basis of TNT) as there is normal hexane. It appears that in previous studies of this kind most of the content of aromatic hydrocarbons has been missed, because they occur in fractions of lower boiling points than would be expected. With the knowledge developed in this work, and with our modern fractional distillation equipment, it is conceivable that in time of war toluene might be produced in large quantities from petroleum.

The most important behavior of the hydrocarbons is their action under application of heat, since this gives us our cracking processes, and will probably also be the basis of many other processes in the future. The mechanism of the cracking of the lighter hydrocarbons has been very thoroughly studied,[35] and the way in which different types of hydrocarbon structures split determined. This information can be applied directly to the processes for reforming gas, and the general principles applied to cracking and carried into further studies of the more complex hydrocarbons. The research has even gone back of the mechanism of these reactions into what the chemist calls their kinetics.[7] This field involves not only what happens, but why it happens; and gives a means for correlating information and predicting what will happen. The whole field of kinetics of hydrocarbons has been opened up by this work, and some semblance of order brought out of what before was chaos. The field has incidentally proved to be so interesting that many other investigators have been drawn into it. It further appears that there is a very close analogy between the decomposition reactions of hydrocarbons under heat and under conditions of electrical discharge. The investigation[8] of behavior under the latter conditions throws also considerable light on what happens to electrical insulating oils under electrical stress.

Thermodynamics

The science of the thermodynamics of chemical reactions has in recent years proved to be one of the most valuable tools of the research chemist, since by it he may calculate whether any certain reaction is possible or impossible, and if possible, under what conditions. The petroleum chemist has been handicapped, however, in years past by the lack of fundamental thermodynamic data on hydrocarbons which would permit him to make these calculations. The institute's research work [20] has yielded a considerable amount of these data. Without them much useless work has been done in trying to do the impossible. For example, many research men have tried to make methanol directly from methane and water, a reaction quite possible on paper, but quite impossible thermodynamically.

Research work on the reactions of hydrocarbons is dependent upon accurate methods of analysis of the product mixture. In the course of some of the researches, excellent methods of analysis of mixtures of the lighter hydrocarbons have been described.[14, 18, 19] Synthetic methods for making these hydrocarbons have also been improved.[14, 19]

The chemical engineer designing fractionating columns, heat exchangers, condensers, and similar refining equipment has needed tables on the thermal properties of petroleum fractions similar to the steam engineer's steam tables and the refrigeration engineer's ammonia tables. Such a series of tables has now been compiled and published.[23] Valuable data for the engineer have been obtained experimentally on the compressibility of oils[28] and on the specific heats of the hydrocarbons at low temperatures.[29] The compressibility of butane has been worked out.[22]

The oxidation of hydrocarbons concerns not only detonation of gasoline, color formation of oils, gum formation in gasoline, and such matters, but may lead to a large number of synthetic preparations such as insecticides, fungicides, and alcohol denaturants. The field of slow oxidation of some of the hydrocarbons has been surveyed, and detailed analyses made on the products.[2] As expected, the oxidation product is a very complex mixture containing many classes of oxygen compounds. The positive identification of these compounds which has been made will be of help to the petroleum research chemist.

Compounds in Petroleum

While as already stated the chemistry of petroleum is largely the chemistry of the hydrocarbons, nevertheless, some of the refiner's most troublesome problems come from compounds which occur in petroleum or in its fractions in very small quantities. These compounds are not only a nuisance practically, but are still more exasperating in that they are a potential source of additional profit if they can be isolated and turned to the proper uses. Incidentally, one of the interesting, but unfinished, pieces of work under the institute's program has been the adaptation of a new tool, the so-called "dropping mercury cathode" to the identification of some of these compounds occurring in small quantities. The use of this tool has interesting possibilities.

Probably the most offensive of these impurities, if we may call them that, are the sulphur compounds, since they have caused so much grief to the gasoline refiner. Our ignorance in relation to these compounds has been double-barrelled: first, we have had little information as to exactly what classes of sulphur compounds were present in petroleum and in raw gasoline; and, second, we have had practically no knowledge of the chemistry of the groups of compounds which we knew or suspected were present. Attempts in this work on the first point, i.e., to isolate and identify the sulphur compounds in petroleum more completely than has been done in the past, has given negative results,[17] but valuable none the less in saving other research men much effort which they might expend along the same lines. One by-product of this work, however, has been a list of the miscibility relations between petroleum and 61 different solvents. On the second phase, the work has produced very valuble results. The mercaptans have been thoroughly studied,[26] and their chemistry worked out. Since this is the class of compounds at which the sweetening process in the refinery is aimed, much has been learned about this process, not only using the conventional doctor treat, but using other methods such as copper or zinc in place of lead. It has been shown why a normal gasoline cannot be sweetened with a solution of caustic soda alone, no matter how strong; but that a natural gasoline or liquefied gas can be. A very satisfactory analytical method for mercaptans has been devised. The chemistry of the sulphides,[25] disulphides,[26] and thiophanes[27] has been studied to some extent, the work unfortunately being cut short by the termination of the institute's research program. A number of new compounds in these groups have been prepared, however, and their properties studied.

Another attack on the sulphur problem has been on the decomposition of the sulphur compounds with heat in the presence of a catalyst, such as nickel, and in the presence or absence of added hydrogen.[40] Considerable decomposition of sulphur compounds was obtained with the splitting off of hydrogen sulphide. The presence of hydrogen improved the reduction of the sulphur content of gasolines. This principle may have important commercial application.

The nitrogen compounds in petroleum, which have been such a nuisance to the refiners of California crude, have been the subject of an excellent piece of work,[3] involving their isolation and identification. They belong to a new series of nitrogen compounds, heretofore unknown in chemistry, but closely related to the vegetable alkaloids such as nicotine, atropine and quinine. They may lead to "petroleum alkaloids" of equal value. The possibilities are extremely interesting.

Incidental Information

Like all other research work, that under the institute's program has produced much incidental information which compares favorably in value with the main results. Improvement in laboratory fractional distillation technique[9] is one of the most valuable of these, and has assisted and stimulated research men in laboratories all over the country. Our knowledge of absorption of a gas by a liquid has been enhanced,[39] new laboratory technique developed in vacuum receivers,[30] combustion analysis,[4] magnetic pumping of vapors,[5] and vapor density determination,[6] and a new solvent, dotriacontane,[24] proposed for cryoscopic molecular weight determinations. These are only a few of the items, and are cited simply as examples.

Occurrence and Recovery

While this summary of research work is confined primarily to the projects of interest to the refining branch of the industry, it would not be complete without mention of some of the major accomplishments connected with occurrence and recovery† of petroleum.

Since knowledge of the origin and generation of oil is indispensable to the petroleum geologist, a study[4] has been made, and is still under way, of sediments now being deposited under conditions which are believed to duplicate the accumulation of the source sediments of our present petroleum. Many dependable quantitative data have been collected on the organic matter contained in these sediments. The theory that the mashing and shearing of the rocks incident to folding and faulting was at least partly responsible for the generation of petroleum from the organic matter in the source bed has been subjected to very critical examination.[1] The results of the work appear to disprove this theory conclusively, and to remove it from the realm of argument. Another excellent piece of work[3] has

(Continued on Page 114)

PETROLEUM REFINING IN INFANCY

The science of petroleum refining is undoubtedly in its infancy. The last ten years have seen the beginnings of a revolution, and it is difficult to forecast what the next ten years hold. It doesn't need a Daniel, however, to predict that the refining industry of the future will not be satisfied with the manufacture of fuels and lubricants, but that it will produce also by synthetic methods such materials as soaps, rubber, drugs, textiles, and possibly even foods. Our raw material contains far too great possibilities for us to be satisfied indefinitely with simply burning it up.

Now a man can't raise a good wheat crop in a forest. First, he must clear the ground and then carefully prepare the soil before he sows the seed and is ready to raise and harvest his crop. We, too, must clear our ground and prepare our soil in order that we may raise the crop which we visualize as potential. The clearing and preparation is accomplished by fundamental research, and by this means only. There are no short-cuts. Sometimes a man is lucky enough to obtain a field which someone else has cleared and prepared. The coal tar industry did that, and its various ramifications have been raised largely on ground carefully prepared years before by the exhaustive fundamental researches in the laboratories of Germany. Our industry has not been so lucky.

It is a little difficult to look at a bare field, no matter how carefully prepared, and picture the flourishing crop to come and the profit which it will make for its owner. This is exactly the difficulty with which I am faced in attempting to evaluate what has been done to prepare our field by means of the venture into fundamental research made by the American Petroleum Institute and made possible by the generous gifts of John D. Rockefeller and the Universal Oil Products Company.

*Annual meeting, American Petroleum Institute, Chicago, November 12.

[a] The figures indicate the number of the project to which reference should be made. A list of the projects is appended.

†The writer wishes to acknowledge the assistance of H. H. Hill and K. C. Heald in the preparation of the subsequent paragraphs relating to these subjects.

Oklahoma Oil Industry In Peril

The oil industry in Oklahoma stands in importance, second to agriculture. It occupies first place in the industrial development of our cities and state. From its products come the principal sustaining public revenues for the upkeep of the state. It has given tremendous financial support to the local business man, worker and farmer. To the latter alone, millions of dollars have been paid for mere bonuses and rentals. Its refining and producing properties have produced vast wealth, besides encouraging other capital to come into the state. Today, roughly speaking, the gross wealth of the oil industry in Oklahoma will exceed one billion dollars. Our undeveloped oil resources may be yet largely untouched, but reserved for the future benefaction of our citizenry.

The story of oil is replete with inter-mixed sorrow and happiness. The drilling of wildcat wells involves a tremendous hazard. While suddenly in some communities unexpected wealth transforms a financially despondent community into that of great happiness and prosperity, other wildcat drilling tests entail a complete financial loss.

It is obvious that the general welfare of our entire state demands the encouragement of the oil industry in our midst, that we may reclaim the enormous hidden fortunes of our undiscovered oil and gas reserves.

Naturally, the hundreds of thousands of Oklahomans, primarily dependent upon the welfare of the oil and gas industry, are most deeply concerned in any proposed legislation that may tend to impair or destroy this great industry. Any laws which may place an exceptionally greater hardship in the development of oil properties in Oklahoma than in the great oil states of Texas, Kansas and contiguous country, now without an income tax on oil production, will cause capital to leave this state and go to those other oil producing areas where inequitable and unfair legislation may not exist. The imposition of any drastic or unfair legislation against the oil producer in Oklahome will drive him from the state. It will throw out of employment, hundreds of thousands of our people and bring wide-spread ruin to the welfare of general business. It will prove most harmful to both the country and the towns and cities built largely on the present and future expectations of the oil industry.

The proposal of the Governor of this state for a ten per cent net income tax in Oklahoma, in spite of the fact that no such tax is imposed in the great competitive oil states of Texas and Kansas, will, if enacted into a law, result in great harm to the entire state. When a man lends a hundred thousand dollars, say for five per cent per annum, he is possessed with both principal and expectant interest. An income tax upon his interest may be justifiable, but an income tax upon his principal would amount to confiscation. An income tax on an investment of one hundred thousand dollars in an oil property today would mean a tax upon both the principal and profit, if any. The principal amount of said investment of one hundred thousand dollars must be first returned before the certainty or uncertainty of an actual profit or income can be ascertained.

Because of the very peculiar nature of the oil producing business, the oil states of the Nation have arrived at a gross production tax as the only safe and equitable means for the just taxation of such character of property. Yet, in spite of these facts, it is now urged upon the people of Oklahoma to impose a ten per cent tax upon oil producing properties, involving as the same does, a confiscatory capital tax. The Federal government, in determining the income tax on oil properties, justly recognizes the principle of a depletion of property value whereby the capital invested in oil properties shall be so determined as to prevent a confiscation of the principal in arriving at a just income tax basis.

The underlying forces of genuine productive wealth should be encouraged and not destroyed. Oklahoma needs more business activities and a greater in-flow of wealth than she now enjoys, to stimulate jobs and greater industrial prosperity. Necessary revenues for the upkeep of government can be provided without destroying "the goose that lays the golden egg." First, during perilous times like the present, there should be a severe cost reduction in the upkeep of the government from top to bottom.

The autocracy of wealth in the hands of a few is a menace to the Nation. Measures to recapture and redistribute this wealth involves a federal undertaking. In Oklahoma, a greatly diminished number have any income. To surcharge the atmosphere with opprobrious denunciation against the respectability of substantial property owners and citizens of this state cannot appeal to our many citizens who are today most seriously worried and thinking carefully as to the best means to sustain a living opportunity.

Let us not drive our own people and foreign wealth to other states, now possessing possibly greater opportunities for success than we have at home. It is not an abstract proposition of one being for or against an income tax. Instead, it is a question as to whether we shall adopt measures tending to destroy the economic opportunity of the people to live and dwell in Oklahoma with comparative peace and happiness.

This space contributed by a member of the Mid-Continent Oil & Gas Association.

DIVIDENDS FROM FUNDAMENTAL RESEARCH

(Continued from Page 112)

given experimental basis for the belief that there can be "recurrent" generation of oil, i.e., that one type of organic matter in a formation may break down at one period under certain conditions of temperature and pressure to form petroleum, but that enough organic matter will be left to form another crop of petroleum when subjected at a later geological period to other conditions of temperature and pressure.

The possible significance of earth temperatures in connection with geologic structure, and with the movements and accumulation of petroleum, is just beginning to be appreciated. A large amount of valuable data on this subject has been collected under one of the projects[25] from oil fields in Oklahoma, Texas and California. It is believed that these data, with other similar data as accumulated, can be correlated so as to furnish another valuable tool for the investigation of geologic structure.

The fundamental data necessary for the calculation of repressuring and pressure maintenance programs are being obtained. The work,[26, 27] though rather recently undertaken, has already furnished valuable information for petroleum engineers on the rate of solution of gas in oil and the effect of dissolved gas on the surface tension of the oil. These data are immediately applicable.

Work Should Be Continued

On account of the termination of the institute's program on July 1 of this year, and the inability of the industry to continue it at this time except with a very drastically curtailed program, including on the refining side only the project on the hydrocarbon composition of petroleum, there remains a large amount of unfinished work which will not become of value unless means are found at some future date for finishing it. This type of fundamental work must be done. It appears far more economical to do it in university laboratories, where the work is open to all, than to have the industrial laboratories duplicating each other's work. It is earnestly hoped that when the present two-year program is over, the industry will be in a position to take up again and carry on the type of work begun under the five-year program.

If it is difficult to evaluate the actual definite results of the research work, it is much more difficult to evaluate the other effects which the work has had. Probably the most important of these is the stimulation of scientific thought along the lines of the petroleum hydrocarbons. This subject was formerly looked upon as extremely difficult and unattractive. The word "paraffin" itself comes from roots meaning nonreactive. The institute's projects have emphasized that the paraffins do enter into reactions under the proper conditions and environment. The success of the research work in this difficult field has, therefore, offered a challenge to the scientific world, and has made of the chemistry of our hydrocarbons a fascinating and absorbing study for chemists and physicists. Large numbers of investigators have turned their attention to this subject, with the result that much more work has been done than that for which the industry has paid.

The industry, through its experience, has now learned how to handle this kind of co-operative research work. At the initiation of the program, there was considerable misgiving that the industry would drag it out of fundamental paths into the solution of its own pressing nonfundamental problems. For this reason the direction of the work was placed in the hands of the National Research Council. The central petroleum committee, which the council set up immediately, saw the need of advice from the industry; and after two years finally insisted that an advisory committee from the industry be appointed. The co-operation of these two groups has resulted in much greater progress over the last three years of the program.

There can be no question in the mind of anyone who carefully studies the results from the institute's projects that the work is paying, and will continue to pay, dividends. How great these dividends will be depends very largely on the industry's willingness to continue and expand the fundamental basis which the five-year program has begun.

APPENDIX

American Petroleum Institute Fundamental Research Projects

(Following the subject, the director and place of research are given.)

1. Generation of Oil in Rocks by Shearing pressure; Warren J. Mead; University of Wisconsin, Madison, Wis.
2. Action of Oxygen on 1, 4-Dimethylcyclohexane; George Chavanne; University of Brussels, Brussels, Belgium.
3. Studies of Source Rocks in the Microfurnace; David White; U. S. Geological Survey, Washington, D. C.
4. Origin and Environment of Source Sediments; Parker D. Trask; Princeton University, Princeton, N. J.
5. Diatoms as a Source of Oil; L. B. Becking; Leland Stanford University, Stanford, Calif.
6. Separation, Identification, and Determination of Constituents of Petroleum; E. W. Washburn; U. S. Bureau of Standards, Washington, D. C.
7. Catalytic Methods Applied to Petroleum Hydrocarbons; Hugh S. Taylor; Princeton University, Princeton, N. J.
8. Effect of Electrical Discharge on Gaseous Hydrocarbons; Samuel C. Lind; University of Minnesota, Minneapolis, Minn.
9. Analysis of Hydrocarbons by Time-Positive Ray Method; R. A. Millikan; California Institute of Technology, Pasadena, Calif.
10. Analysis by Fractional Distillation from Absorbent Materials—Both of Light and Heavy Members of Hydrocarbon Series; same as No. 9.
11. Analysis of Gradual Oxidation Prior to Ignition of Fuels in Internal Combustion Engines, and Relation to Detonation; same as No. 9.
12. Comparison by Millikan Viscosity Methods of Viscosities and Mean Free Paths of Ring and Chain Hydrocarbons of Same Molecular Weight and Composition; same as No. 9.
13. Determination of Physical Properties of Petroleum and Petroleum Products; E. H. Leslie; University of Michigan, Ann Arbor, Mich.
14. Preparation of Pure Typical Hydrocarbons, and Study of Their Behavior Heated Alone and With Catalysts; Howard J. Lucas; California Institute of Technology, Pasadena, Calif.
15. Study of Cyclopentane Fractions of Southern California Petroleum; E. Emmet Reid; Johns Hopkins University, Baltimore, Md.
16. Isolation and Investigation of Thermo-labile Hydrocarbons Present in Petroleum; James B. Conant; Harvard University, Cambridge, Mass.
17. Isolation and Study of Sulphur Compounds in Petroleum; Frank C. Whitmore; Northwestern University, Evanston, Ill.
18. Noncatalytic Thermal Decomposition of Pure Hydrocarbons and Related Compounds; Charles H. Hurd; Northwestern University, Evanston, Ill.
19. Study of Relative Rates of Reaction of Olefins; Harold S. Davis; Massachusetts Institute of Technology; Cambridge, Mass.
20. Isolation and Investigation of Nitrogen Compounds in Petroleum; J. R. Bailey; University of Texas, Austin, Tex.
21. Determination of Physical and Chemical Properties of All Types of Sulphur Compounds in Petroleum; A. E. Wood; Mississippi College, Clinton, Miss.
22. Thicknesses and Characters of Strata, Deeper Sedimentary Basins of North America; Raymond C. Moore; U. S. Geological Survey, Washington, D. C.
23. Limestones and Dolomites as Reservoir Rocks; A. H. Daniels; University of Illinois, Urbana, Ill.
24. Structural Relations of Beds Separated by Converging Strata; V. E. Monnett; University of Oklahoma, Norman, Okla.
25. Determination of Geothermal Gradients in Oil Fields on Anticlinal Structures; Charles N. Gould; Oklahoma Geological Survey, Norman, Okla.
26. Determination of Thermal Conductivity of Gases and Its Application to Precise Analysis of Hydrocarbons and Other Gases; C. E. Van Orstrand; U. S. Geological Survey, Washington, D. C.
27. Displacement of Petroleum Oils from Oil-Bearing Sands by Use of Selected Aqueous Solutions; Floyd E. Bartell; University of Michigan, Ann Arbor, Mich.
28. Study of Reactions of a Number of Selected Organic Sulphur Compounds; E. Emmet Reid; Johns Hopkins University, Baltimore, Md.
29. Investigation of Heat Capacities and Free Energies of Typical Hydrocarbon Compounds; George S. Parks; Leland Stanford University, Stanford, Calif.
30. Study of Metallic Constituents of Crude Petroleum; Gerald Wendt; Pennsylvania State College, State College, Pa.
31. Action of Sulphuric Acid on Paraffin Hydrocarbons; F. W. Padgett; University of Oklahoma, Norman, Okla.
32. Equation of State of Certain Easily Liquefiable Hydrocarbons; Jean Timmermans; University of Brussels, Brussels, Belgium.
33. Variation of Pressure Gradient with Distance of Rectilinear Flow of Gas-saturated Oils and Unsaturated Oil Through Unconsolidated Sands; H. C. George; University of Oklahoma, Norman, Okla.
34. Sedimentation and Brownian Movement Studies of Barium Sulphate Particles; R. A. Millikan; California Institute of Technology, Pasadena, Calif.
35. Variation in Surface Tension of Gas-saturated Petroleum with Pressure of Saturation; same as No. 34.
36. Mobility Measurements in Suspended Oil Drops to Test Surface Charges; same as No. 34.
37. Fundamentals of Retention of Oil by Sand; same as No. 34.
38. Thermodynamic Properties of Petroleum Hydrocarbons; C. S. Cragoe and H. C. Dickinson; U. S. Bureau of Standards, Washington, D. C.
39. Analysis of Crude Oil, Distillates, and Residues for Unsaturated Hydrocarbons and Surface-active Matter by Means of Dropping Mercury Cathode Method; J. Heyrovsky; Charles University, Prague, Czechoslovakia.
40. Specific Adsorbents for Sulphur Compounds in Petroleum; H. S. Taylor; Princeton University, Princeton, N. J.
41. The Preparation and Properties of Thiophanes; R. W. Bost; University of North Carolina, Chapel Hill, N. C.

NEW WELDING METHOD ON TEXAS-EMPIRE LINE

(Continued from Page 110)

Aircoweld No. 3 rod and the simplified technique of welding.

The welding is done in a reducing atmosphere created by a carburizing flame. The Aircoweld No. 3 welding rod when molten to a readily recognized condition, can be applied without further manipulation or breaking down of the sides of the vee. The method of welding employed consists of an adaptation of the backhand welding technique with the least amount of fatiguing manipulation.

Welding Organization

The work was scheduled to be completed within 22 working days. Two crews working from opposite ends towards the middle were deemed necessary to carry out this program. The number of men in each firing line crew varied from four to eight welders, depending upon the amount of pipe which could be lined up in advance for these crews. An eight-welder crew, when working on the 40-pound pipe, with the welding vee as shown in Figure 2, was capable of producing 220 joints per 10-hour day when using the Aircowelding technique.

A good average day's work for the same crew, using ripple welding technique, would be less than half as many joints per 10-hour day. Thus it will be seen that an increase of better than 125 per cent, in the number of welds per day is made possible with the Aircowelding technique. The use of a 70-degree included vee on this same pipe (Figure 3) would have increased the output another 75 per cent over ripple welding. Therefore, it is evident that considerable advantage can be gained by the use of the narrower vee, along with the Aircoweld method.

The eight-welder crew produced at the rate of 256 Aircowelded joints per 10-hour day when working on 33.8-pound pipe using a 90-degree included vee, as shown in Figure 5. This was an increase of about 130 per cent over that formerly possible with ripple welding. The use of the 60-degree included vee would have allowed a further increase of 70 per cent over ripple welding in the daily output of the crew.

Along with this increase in the daily output of the crew, there is an attendant reduction in the amount of gases and welding rod used. This reduction in the amount of welding rod used can be readily conceived by referring to Figures 1 to 3 or Figures 4 to 6. The reduction in the gases consumed is due to the decrease in the time of making the weld. In other words, the torch is burning for a much shorter time when making an Aircoweld joint than when making a ripple weld joint. The reduction in the gases consumed is approximately 50 per cent.

Due to the many weights of pipe and the difference in the included angle of the vee that may be used, an erroneous comparison is sometimes drawn between the consumption data on two joints made on pipe of the same nominal diameter but differing in the weight per lineal foot and the angle of the bevel.

The pipe was lined up on dollies and tack-welded into strings up to 400 feet long. The usual firing line method of four men welding on a string was employed. Also the method of one welder on a string was tried out. The output per man and the quality of the welds were the same in each case.

As far as possible the tie-in welds were made on skids over the ditch. Bell hole welds were employed only when necessary. All tie-in and bell hole welds were made by the Aircoweld technique. The weld was started on the bottom and progressed completely around the pipe and was finished on the bottom. The output per day of a tie-in welder was about 66 per cent of a firing line welder. In the case of both gangs the lining up was in control of the welding foreman who therefore was in a position to control the conditions for the firing line welders.

Inspection, Testing and Supervision

As was previously mentioned, all the welders employed on the line were given a qualification test. In order to be acceptable the test coupons taken from the qualifying weld had to equal the strength of the pipe when pulled and withstand a bend of 180 degrees in 1 inch without showing any fracture. Bends were made with and against the weld in order to determine the bond on the top and bottom of the weld. As the work progressed visual inspection of each weld was made by the inspectors on the line. Careful attention was paid to such details as icicles, proper penetration and reinforcement. Visual inspection and pull tests on welds cut out for check purposes were employed throughout the job to check the welder's work.

The interest taken in the Aircoweld method by the inspectors and their appreciation of the advantages in cost and quality, contributed in no small degree to the success of the welding operations. Upon final analysis, it will be found that welders are always influenced by the attitude of the inspectors. An air test was employed on the first sections of the line. The test of the joints showed no pin holes or sweats, so further air test was considered unnecessary. The welding operations were supervised by field representatives of the Air Reduction Sales Co., which assistance is available on any pipe line jobs being Aircowelded.

The finished line included 4,847 welds with one only defective weld shown up upon final testing. This result conclusively proved that the skill required for Aircowelding is well within the proficiency of the average welder.

Conclusions

The use of the Aircowelding method for making pipe line joints will enable high quality welds to be made at a low cost. The test results on this line showed that welds equal to the strength of the pipe material and able to withstand a severe bend test could be made by the average welder following proper instructions. An increase of nearly 200 per cent in the daily output of a welder can be obtained by the Aircoweld method. A saving of approximately 50 per cent of the gases ordinarily used can be effected, along with a corresponding saving in welding rod.

The Aircoweld method, because of its simplicity, lends itself readily to visual inspection of the welding operation and causes less fatigue to the welder. The absence of icicles can be attributed to the inherent metallurgical properties of the Aircoweld rod in the molten state which eliminates the necessity of liners or inside rings. Aircowelding offers all of the advantages of the most recent developments within the oxy-acetylene welding industry.

ABANDON SOUTH DAKOTA TEST

Gypsy Oil Co.'s No. 1 Hunter, NE cor. SW Section 28-3-16, Pennington County, South Dakota, is now shut down at a total depth of 4,998 feet. The company is preparing to abandon the wildcat test at the present depth. A number of sands were found in the test, but they were not productive. It was drilled on a large block of acreage of approximately 75,000 acres which were assembled after a geological survey.

JESS WATTS DIES

OWENSBORO, Ky., Nov. 9.—Jess Watts of Owensboro, one of the most popular men in the oil fields of Hart County, died at his home in Owensboro following a stroke of paralysis.

LEGAL ASPECTS OF UNITIZED OPERATIONS

(Continued from Page 35)

any argument to demonstrate that the operation of oil pools in times past in the old-fashioned sporadic manner has resulted in injuries and losses of a much more serious nature than was ever before appreciated?

Let us now appraise this from a legal standpoint. If, as held by the United States Supreme Court in the year 1900, the facts then known to exist justified and made legal the legislative power to protect all the collective owners by securing a just distribution to arise from the enjoyment by them of their privilege to reduce to possession, it must follow that these new disclosures with reference to reservoir energy furnish a basis more substantial and potent than was then dreamed of for the exercise of the power.

Ownership Rights

The Ohio Oil Co. case involved the constitutional validity of a statute of Indiana which went no further than to prohibit a producer from permitting the oil or gas to escape into the open air. The question was, did that law, which in terms prevented one type of surface waste, deprive the owner of oil wells of his property without due process of law in that it prohibited him from allowing the gas coming out with the oil to blow into the air? To stop the gas wastage the oil wells had to be closed, for there was no market for the gas. Others were producing gas alone from the same stratum and selling it. The court did as all courts do when they come to consider any case that is before them; that is, it determined the facts to which the law related. Doing this, the court pointed to the peculiar characteristics of the substances oil and gas, the manner in which they are held in their natural reservoirs, the method by which and the time when they may be reduced to actual possession and thus become the property of a particular person. The court held that although oil and gas, like other minerals, are situated beneath the surface of the earth, still, except for that one point of similarity, they in many other respects differ from the solid minerals. The court pointed to the fact that they have no fixed situs under a particular portion of the earth's surface within the limited area where they have accumulated, and that "they had the power, as it were, of self-transmission." The court said: "No one owner of the surface of the earth, within the area beneath which the gas and oil move can exercise his right to extract from the common reservoir, in which the supply is held, without, to an extent, diminishing the source of supply as to which all other owners of the surface must exercise their rights. The waste by one owner, caused by a reckless enjoyment of his right of striking the reservoir, at once, therefore, operates upon the other surface owners." But, it is a notable fact that the court, while speaking of rock pressure, nowhere mentioned the existence and presence of "reservoir energy" as we know it today, nor did it say anything whatsoever, for it was not then known, about the utility of this newly discovered force in the recovery and extraction of these substances and the damage that can flow from its dissipation. These, being now known, justify consideration along with the formerly known facts.

It is certainly logical to suppose that if the court had then known thereof it could and would have painted a picture such as we can now paint, a picture which would indeed have depicted possibilities of injury and waste, and with which the one the court formerly constructed is hardly to be compared. Instead of merely saying that no one owner of the surface beneath which the gas and oil move can exercise his right to extract from the common reservoir without to an extent diminishing the source of supply as to which all other owners must exercise their rights, it could well have also said that no one owner of the surface within the area can exercise his right to extract from the common reservoir without also to an extent diminishing the possibility of recovery of the remaining supply. Indeed, it could well have said that reservoir energy which costs nothing is worth millions, that it is the property of all and that no one owner ought to have the privilege of depriving any other owner of the privilege of using a fair share of it. The Indiana statute dealt with waste upon the surface, and hence the court said that the waste by one owner caused by a reckless enjoyment of his right of striking the reservoir at once operated upon the other surface owners. Had the court then known what is now known, it could well have added that the waste upon the surface would constitute but a small fractional part of the waste which would be caused by a reckless enjoyment of his right by one owner, for we now know that by such reckless enjoyment of his right untold preventable underground waste takes place. If the court had had before it the light which is present to us today, it could well have said that unless (a) there is a retarded operation of drilled wells and (b) a program set forth and carried out which will enable all surface owners to enjoy in fair and equitable proportions the benefit of this native recovery and expulsive force, invisible though it be, then not only will an undue proportion of the recovered reservoir content be attributed to some, but also injuries not comparable with the mere inequitable distribution of recovered reservoir content will accrue to the remainder of the surface owners, and an irreplaceable natural resource of great economic value to the human race will be flagrantly wasted underground.

Methods Are Optional

So, from a legal standpoint, the disclosure of this newly discovered thing which we call reservoir energy and its efficient utilization in the recovery of oil finds its place perfectly as a major support for the exercise of the legislative power sanctioned by our great court of last resort, and warrants the conviction that no constitutional rights would be taken away by a regulation calling for its efficient utilization.

Now, as we well know, there are many different methods which have been suggested whereby waste can be prevented and coequal rights protected. The United States Supreme Court has time and again held that in the field of police regulations it is a question of policy and lies within the discretion of the legislature to determine which of several possible methods open to its selection shall be adopted and enforced. The limitation is that the method adopted must bear a reasonable relation to the object in view. It must not be merely arbitrary or capricious. If the legislature selects the poorest rather than the best, or any method between the two, the courts will not strike it down but will sustain it as constitutional if in fact it bears a reasonable relation to a purpose lying within the scope of legislative authority. (Chicago, B. & O. R. Co., vs. McGuire, 219 U.S. 549, 55 L.ed. 338; Block vs. Hirsh, 256 U.S. 135, 65 L.ed. 865; Standard Oil Co. vs. Marysville, 279 U.S. 582, 73 L.ed. 856). Merely because California has one system, Texas another and Oklahoma and Kansas still another, and some states still others, is no reason for believing that the statute establishing either method is not valid.

Now, the location or spacing of wells was in no manner involved in the Ohio Oil Co. case. But we have at least two examples of well spacing and location regulations which were sustained by the courts. One of them restricts the right to drill wells at all upon one's land. These are peculiarly pertinent to the subject now under discussion for they constitute decisions of courts on the question as to what may be legally done to gain the end of a fair distribution.

Oxford Case in Texas

Years ago the Legislature of Texas passed a law which empowered the Railroad Commission to require oil or gas wells to be drilled in such a manner as to prevent injury to the adjoining property. Pursuant thereto the commission issued a regulation prohibiting the drilling of wells nearer than 300 feet from any completed well on the same or an adjoining tract and the drilling of any well nearer than 150 feet from a property line, but it contained a proviso to the effect that the commission might grant exceptions and permit drilling within shorter distances. The Oxford Oil Co. owned a lease in a Texas oil field upon a strip of ground more than 3,000 feet long and about 45 feet wide. The adjoining leases on either side were large tracts, and thereon wells could be drilled at distances permitted by the regulation. The Oxford company planned to drill 10 wells which would have been about 300 feet apart but each one much less than 150 feet from property lines. By a special order the commission, while permitting the drilling of wells on the strip, limited the Oxford company to the drilling of four wells instead of 10, and it prescribed that they should be located at certain designated places on the narrow strip of land. In Texas the landowner owns the oil and gas in place under his land and the Oxford company as the lessee of the landowner acquired the title to the oil and gas in place in and under said strip of land. But in Texas the courts have long held that a producer has the same right as in Pennsylvania and elsewhere to reduce to possession all the oil and gas which he is able by wells drilled on his land, regardless of where in the reservoir he may draw from. The Oxford company drilled the four wells instead of 10 and then sued the adjoining owners and the members of the commission for damages in the amount of the value of the oil which it claimed it had lost by reason of its not being permitted to do that which it claimed it had the legal right to do, as defined by the decisions of the Texas courts. Here the human element again stood upon its legal rights. The federal District Court and, on appeal, the United States Circuit Court of Appeals, held that the legislative power existed to so regulate the drilling of wells for oil and gas as to conserve the right of adjoining owners, and denied any relief to the Oxford company. (U.S.D.C. Tex. 16 Fed. (2) 639; U.S. C.C.A. 5, 22 Fed. (2) 597). Now, of course, through the particular wells drilled the Oxford company did not take out all of the oil and gas which originally lay under its leased premises, and it undoubtedly extracted some which lay under the lands of the adjoining leaseholders, and they, at the same time, extracted much that lay under unprotected parts of the narrow strip of the Oxford company. The regulation and its enforcement did in a loose sense conserve the right of adjoining owners and at the same time deprived the Oxford company of none of its just share of the reservoir content. The enforced regulation in said case was sustained upon the authority of the Ohio Oil Co. and other cases. Will anyone say that a regulation which comes more nearly accomplishing absolute fairness and equity as between the producers instead of merely approaching it perhaps half way, as did the one enforced in the Oxford case, would not be valid since the regulation in the Oxford company case was sustained? The United States Supreme Court by indirection approved this holding, for it refused to grant the Oxford company's application for a writ of certiorari to obtain a review of the decision rendered against it. (77 U.S. 585, 72 L.ed. 1000.)

The Oxford, Kans., Case

An oil field encroached upon the city limits of the city of Oxford, Kans. Under the general rule as announced by the courts of the State of Kansas, a landowner has a right to drill a well upon his land and to produce the oil freely therethrough without regard to injury to his neighbors by drainage. In the absence of a law to the contrary, certainly each lotowner or his lessee in the part of the city of Oxford lying over the pool had the right to drill a well upon his lot and to operate it to whatever extent he should choose. But the city council passed an ordinance which prohibited the drilling of more than one well on a city block, although in every block there were a number of different lotowners. The ordinance required that a permit be obtained for the drilling of the one well within each block, and it provided that all of the several owners of other lots or their lessees should have the privilege of enjoying shares in the production from the one well in the proportions which the areas of their respective lots should bear to the total area in the block upon payment of their respective proportionate parts of the cost and expense attending the drilling and operation of the well. It provided that a one-eighth royalty should be divided among the several lessors of leased lots upon a like basis, but without any liability on their part for cost and expense. Marrs and others sued in the federal court to enjoin the enforcement of the ordinance and contended that the ordinance was invalid in that it deprived them of their constitutional rights to drill upon and operate their own premises as they should choose. The lower federal court in Kansas (24 Fed. (2) 541) and the United States Circuit Court of Appeals for the Eighth Circuit (32 Fed. (2) 134) both sustained the constitutional validity of the ordinance and denied the relief sought by those who attacked it. True it is that the courts predicated their decisions in part upon the fact that safety to property and the comfort of the inhabitants of the town amply justified the city council in the adoption of the ordinance; but neither court stopped there for they both went further and applied the principle of the Ohio Oil Co. case, holding that no leaseholder who was denied the right to drill a well at all upon his premises was deprived of any constitutional right since the ordinance provided that he should be privileged to share upon a fair basis in the production had through the one permitted well upon his contributing upon a like basis to the cost and expense of drilling and operating it, and that no royalty owner was deprived of any property without due process of law for he was permitted by the ordinance to share in the royalty, free of cost, upon a like fair basis.

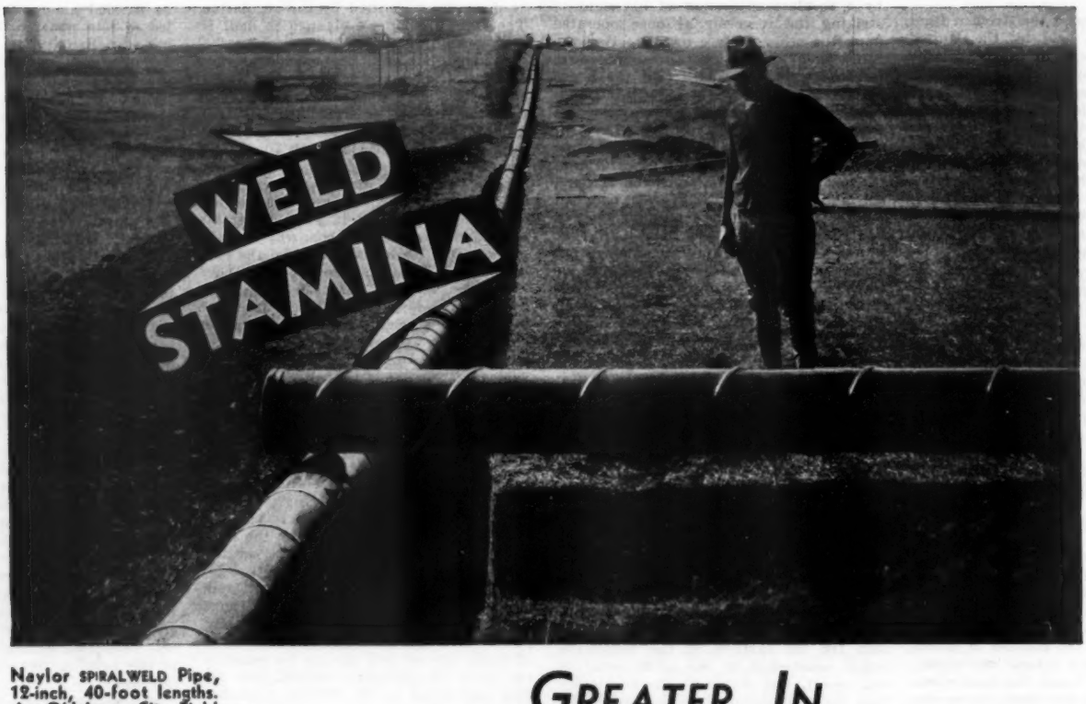
The United States Supreme Court, by indirection placed its stamp of approval upon this decision when it refused to grant the petition of the losing parties for a writ of certiorari to bring the case up for its review. (280 U.S. 573, 74 L.ed. 625.)

Oxford Case and Oil Pools

It requires but a suggestion to satisfactorily analogize the situation in the city of Oxford case to the operation of an oil pool according to the method contemplated by the new conception. If it be true that a law is constitutionally valid which will permit but one of several lotowners in a city block to drill in the block and produce from the subsurface reservoir doing so upon condition that all others shall be given the opportunity to share in the production upon a fair basis, then why would not a law be constitutionally valid which extended the territorial area of the application of the same rule? Now I do not understand that the new conception contemplates, save in exceptional situations such as town-lot areas or irregular tracts, that any landowner or his lessee should be deprived of the right to drill upon and produce his fair share of the reservoir content through wells upon his own land, in the absence, of course, of voluntary agreement for pooling acreage; but the fundamental principle is that a proprietor may be required, if he will not voluntarily do so, to conduct his development and his operations in a manner which will conform to a plan of development and operation of the pool as a whole admitting of the recovery of the largest possible amount of oil and gas at a minimum cost to the operators as a whole and at the same time enable each and every proprietor and/or his lessee to extract or receive his full, fair and equitable share of the recoverable content and no more.

In the light of these decisions and considerations it seems to me to be impossible to escape some legislative regulation, and also that we are warranted in the belief that the new conception is susceptible of legal accomplishment.

Certainly the least possible regulation should be sought. Just how much is needed and how little can be got along



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with are questions which will require some careful and sympathetic study.

The fear on the part of some that the antitrust laws may be violated if they become a party to any arrangement for carrying into execution the new conception, becomes a factor, so it seems to me, of little or no consequence. This is for the reason that other conditions which have already been discussed make it imperative that there be some kind and degree of legislative restraint if the conception is to become of practical value. If we pursue a wise course of action in oil production which is not only sanctioned but also required by a valid state law, in an effort to remedy the existing evils herein described, and do nothing more than that, surely we cannot bring ourselves under the condemnation of antitrust laws. Neither the public nor state nor federal officials, including legislative bodies, should be led or persuaded to a contrary belief and to the making of accusations that a monopolistic state of affairs will be brought about when such a legislative program is respected. It is, of course, as possible for those engaged in the oil producing industry to enter into forbidden monopolistic arrangements and engage in a course of conduct which will constitute restraint of trade and commerce in a manner forbidden by laws against trusts and monopolies as it is for those engaged in any other line of endeavor to do so; but it is certainly one thing to so operate an oil pool that injury will occur to no producer therein and the State's natural resources will be conserved in the manner in which the oil and gas are brought to the surface and made available as a raw product for entry into the channels of trade and commerce, and another thing of an entirely different character for combinations to be entered into which bring about an undue limitation on competitive conditions or constitute unreasonable restrictions upon competition in dealing with the produced raw product, and which restrain the free flow of commerce and trade therein to the injury of others.

Does Not Suppress Competition

It cannot be truthfully nor justly said that the purpose in carrying out the new conception is to suppress or interfere with legitimate competition in trade in crude oil or natural gas, for it has a distinctly and fundamentally different object which is of a most praiseworthy character, that is, the elimination of the evils attending, not competitive production, but avaricious production, and the substitution in lieu thereof of the reasonable protection of every citizen fortunate enough to own land underlaid with oil and gas in the fair and reasonable enjoyment of his landed estate. The new conception if adopted would become a rule of property to the effect that every landowner is entitled to take out of his land the oil and gas which underlay it, and that no other landowner may have the privilege of robbing him of it, but, with the necessary qualification that in as much as it is physically impossible for any landowner to take the oil and gas which underlay only his land without disturbing the like rights of his neighbors with respect to their lands, he shall be given a fair opportunity to take that part of the whole which corresponds to the recoverable deposits within his land, giving him the opportunity to take his share through his land save in exceptional situations. As stated, it is one thing to co-operate to gain these ends and another thing of a different character to enter into a combination in restraint of trade in the produced oil.

A fair maiden was standing by a sparkling spring bitterly weeping, and a passing equestrian said to her: "What is the matter?" She replied, "I have an opportunity of marriage and I am afraid that if I consummate the arrangement I may become a mother and my child may fall in this spring and drown." Now, it may not be quite appropriate to apply this story here, but it illustrates the point that the danger of violating the antitrust laws must grow out of something other than a mere adoption and execution of the new conception in producing our oil.

There is another consideration which probably should not escape our attention. It is that it lies within the power of the legislature of a State to pass laws which will promote the prosperity of its citizens. It is not uncommon for a state legislature to pass a law of this character. The United States Supreme Court has frequently held that the police power of a State extends not only to the protection of the lives, limbs, health, comfort and quiet of all persons, but also to the promotion of the prosperity of its citizens. It has also held that neither the due process clause of the Fourteenth Amendment to the Federal Constitution, broad and comprehensive as it is, nor any other amendment thereto, was designed to interfere with the power of a State, called its police power, to prescribe regulations for these purposes, including an increase in the industries of a State, the development of its resources and additions to its welfare and prosperity. (Barbier v. Connolly, 113 U.S. 27, 28 L.ed. 923.) Many state laws designed solely to promote the prosperity of its citizens have been sustained.

Bacon v. Walker, 204 U.S. 311, 51 L.ed. 499; C.B.&Q. v. People, 200 U.S. 561, 50 L.ed. 600; Sligh v. Kirkwood, 273 U.S. 52, 59 L.ed. 835; Detweilder v. Welch, (C.C.A. 9) 46 Fed. (2d) 75; Marrs v. City of Oxford, (D.C. Kan.) 24 Fed. (2d) 541; People v. Associated Oil Co., (Cal. Sup.) 294 Pac. 717; Liberty Warehouse Co. v. Burley T. G. Co-op. M. Ass'n., 276 U.S. 671, 72 L.ed. 473; Tobacco Growers' Co-op. Ass'n. v. Jones, (N.C.) 117 S.E. 174, 33 A.L.R. 231; Commonwealth v. Hodges, (Ky.) 125 S. W. 693.

Destructive Competition

Therefore if the producers of oil should be so fortunate as to have the sanction of state legislatures to carry into execution the new conception and as a result the producing petroleum industry should be privileged to enjoy a fair and reasonable degree of prosperity, such fact would certainly not pronounce the law as unconstitutional, but it should constitute an added reason for the sustenance of its constitutional validity. It is not the desire of producers that the price of crude oil be fixed by state law or by any administrative agency, for they are willing at all times that the law of demand and supply shall operate freely, but it is desirous, and justly so, that in times of excess production it shall never again encounter a condition in which producers are engaged in a war of self-extermination. Such a warfare could not exist were it not for the peculiar characteristics of oil and gas (found, as they almost invariably are, beneath the lands of many proprietors), coupled with the existence of the human element. In other industries destructive competition of the type which can rage in the production of oil from the ground can hardly come to pass and this for the obvious reason that in no other industry are natural conditions in any conceivable sense comparable to those obtaining here. In no other industry can the human element, as in this one, take advantage of natural conditions to wreak ruin and destruction upon his fellow man. In this industry it is possible while we are engaged in the battle for self-preservation in oil production to be marching into the jaws of death. It is invariably a destructive self-preservation. While we are forced to protect our property from appropriation by others, yet in the very operation we are pulling down upon our heads another form of annihilation. A self defense that is itself ruinous might as well never have been made. The fact that we have heretofore made it at all can be accounted for solely because of the hope each time that the morrow would bring a better day. In times long gone by when we had an era of overproduction (attended as it inevitably was by criminal waste and incomprehensible injury), we felt sure that the day would come when there would be a scarcity of production and our hope was pinned upon that fact, but now hope cannot be well planted there and we must look elsewhere. Our hope now lies in the confidence that men will be reasonable and will consent to doing away with the necessity of fighting the destructive battle of self defense, and substitute in lieu thereof a willingness to give every other man an opportunity to enjoy that which reasonably belongs to him, and thus we will be enabled to carry on as we should, with a fair degree of prosperity, and at the same time will bring no injury to the public.

PROBLEMS OF THE PETROLEUM INDUSTRY

(Continued from Page 33)

ness and not at all concerned about the conservation or protection of the older areas. Their interest selfishly is centered in the profit possibilities of the moment. Opportunists they flow their wells recklessly to the limit, disrupting the markets and destroying the business and the property of others, riding the crest until their wave of good fortune breaks and ebbs, deserting the wreckage their greed has left. Should any demand details, I refer him to the history of the East Texas oil field, the most conspicuous and recent example of the ruthless destruction of an entire industry's welfare, without regard to anything other than a temporary benefit to an unscrupulous promoter.

I submit that in the case of petroleum the "unalterable law of supply and demand," if subjected to no wise and prescient interpretation, degenerates into the jungle law of the "survival of the fittest." Permit that currently to happen, and Kettleman Hills, Oklahoma City, East Texas and a few other oil producing areas, with their less than 5,000 wells, will supply the entire demand for crude oil in this country. Tranportation differentials might make possible the operation of a few other wells in favorable locations, but generally speaking, the complete abandonment of small wells would result. Thousands of men would be rendered idle and the physical and economic waste would be enormous.

Safeguard Future Supply

But interpret the law of supply and demand in the light of a statute calling primarily for the balancing of these two factors rather than their unrestricted individual development, and you provide for the continuance in operation of the necessary and invaluable smaller wells by proper proration of flow from the larger producers. It is not a matter of striving to justify the existence and operation of uneconomic sources of oil, but of safeguarding the future supply of an essential, irreplaceable commodity. It is not a matter of supporting the weak at the expense of the strong, or coddling the small to the annoyance of the large, but of conserving assets, small as well as large, threatened by destruction.

It is my opinion that it is to the best interests of the consumer as well as of the producer, indeed, of the nation itself, that small wells be permitted to produce to their maximum capacity and that the price of crude oil be sufficient to cover their operating costs.

Recent decisions of the regulatory bodies of the states of Kansas, Oklahoma and Texas indicate that they recognize that theory as sound and on that basis they will enforce proration in their several areas. In fact, the governments of the chief oil producing states appear to have come to a full realization that this great natural resource must be produced and consumed in a manner that avoids waste, meets demand and insures both industry and states of reasonable prosperity. The action of these bodies is sufficient evidence that the economic rather than the jungle interpretation of the law of supply and demand has won the approval of constituted conservation authorities. For the first time in history these bodies have joined in a program which contemplates limitation of oil production to recommended amounts for the latter portion of 1931 and all of 1932. Court decisions have tended to uphold the theory of equitable rights in particular oil producing areas and the authority of state governments to use their police powers to enforce reasonable regulations upon production. It would seem that such laws in the future will be strengthened rather than weakened.

The antitrust laws admittedly are a definite discernible barrier to any great progress in stabilizing the operations of our refining branch. Still they cannot be construed as prohibiting individual and voluntary action. They are decidedly a thin alibi for the failure of refiners separately and independently to follow the proved and approved operating charts prepared periodically for them by committees of the Federal Oil Conservation Board and the institute. These two committees, working independently, have supplied the industry in general and refiners in particular with forecasts of expected demand and estimates of necessary supply. So remarkably accurate have these been that they may be accepted henceforth as positive statements of what will happen during the succeeding period.

Gallonage Versus Profits

It is regrettable, to say the least, that the refining branch has not given them due attention. Some executives apparently have left the control of refining operations to manufacturing and sales departments. Volume and unit cost, rather than demand and cost of production, seem to be the influential factors. The ease with which continued distressing conditions in the refining branch could be avoided makes their sufferance the more ridiculous.

More serious at the moment, perhaps, than the problem of duplication of marketing facilities, is the situation growing out of gasoline taxation and resulting tax evasion. Reliable estimates place the total of such taxation this year at around $500,000,000 and total tax evasion at 4 to 10 per cent of that amount. Certainly evaded taxes run into millions of dollars, representing a great financial loss to the states, a reduction in the business and profits of this industry and an imposition upon reputable gasoline marketers.

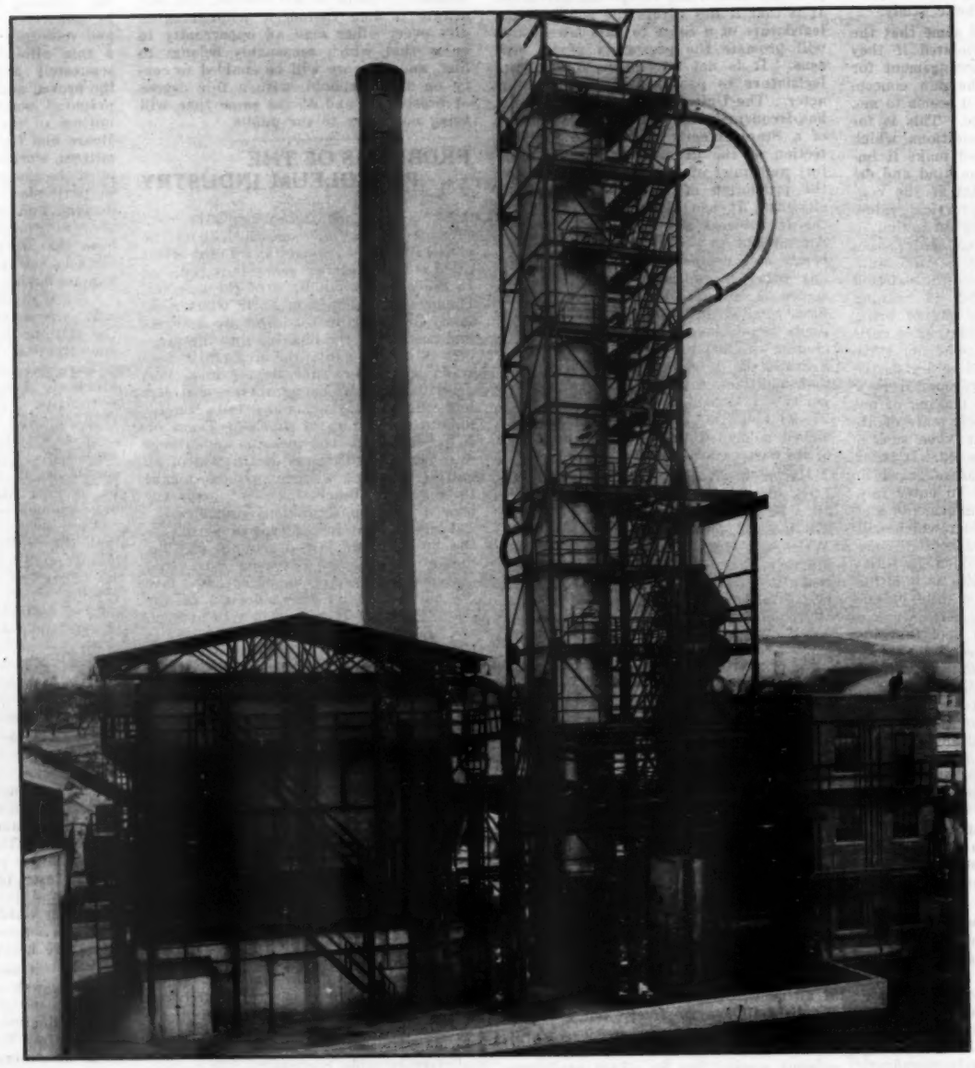
The losses, in a larger sense, are reflected in curtailed road-building programs for lack of funds and a consequent demand for increased tax rates to recoup the deficits. The cumulative result is to place a larger premium upon violation of the tax laws, to encourage gasoline bootlegging and tax evasion and to add to the unfair burdens of tax collection and unethical competition with which marketers are laden.

Gasoline Taxation

The growth of gasoline taxation has been hidden by the continued and extreme reduction in gasoline prices. The tax therefore fails to pain the taxed as much as otherwise it might. But the consumer is beginning to realize that rising taxes and increasing tax evasion are creating an intolerable situation, and the marketer is winning consumer support and good will for efforts to improve conditions that are as unfair to seller as to buyer. Since the gasoline tax must be viewed by this industry as a definite and sizable handicap to any recovery in gasoline prices, that good will may be cherished as a precious asset. Sight should not be lost of the facts that economy is the order of the day, that oil and asphaltic road surfacings meet not only the requirements of economy but the needs of most of our highway mileage and that the problem of gasoline taxation might possibly be solved by reducing rates to the lowest common denominator and employing revenue derived in building greater mileage of really economical roads.

I have tried in these words to present to you a picture of our industry and the necessity for its stabilization. Let me say something about the means to that end. There are many obstacles, laws, traditions, inertial difference of opinion and the like, but the experiences of other industries indicate that the desired end may be reached by doing comparatively simple things. The first is collective curtailment of production, or the adjustment of supply to demand. The second is orderly liquidation of excess stocks. The third is reduction of costs. And the fourth is development of uses and markets. But regardless how simple the method, it is necessary to take action. Calvin Coolidge put the matter exactly when he said recently:

"If all the folks in the United States would do the few simple things they know they ought to do, most of our big problems would take care of themselves."



Effective Distillation Units

This installation handles 7,500 barrels per day of pressed wax distillate or dewaxed solution for the production of lubricating oils.

An aluminum covered tower assures minimum maintenance of insulation.

The tube still may be fired by oil or powdered fuel, coal or coke pulverized in a Hardinge ball mill.

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FOSTER WHEELER

Brief Items for Petroleum Refiners

Appoint E. L. Shea Executive Head of Tide Water Company

NEW YORK, Nov. 9.—Edward L. Shea, for 14 years an active member of the Tide Water Oil staff in various departments, has been appointed execu-

Edward L. Shea

tive vice president in charge of all the company's operations. The appointment was announced by Axtell J. Byles, president. Mr. Shea until recently was vice president in charge of sales, but he is deemed particularly fitted for his new and enlarged responsibilities because of his years of experience with Tide Water in practically all branches of the business, including the producing, refining and sales operations.

Starting as a salesman for Tide Water in the New York territory, Mr. Shea later spent considerable time at the Bayonne refinery. He then was transferred to the producing fields in Mexico. His first major executive post was vice president in charge of manufacturing, which he held prior to his appointment as vice president in charge of sales. Mr. Shea's new responsibilities will include, besides those he has held in the past, many other phases of Tide Water's activities.

MAY UNIFY MARKETING

NEW YORK, Nov. 7.—Royal Dutch-Shell and Anglo-Persian Oil Co. have completed plans for formation of a jointly owned company to handle all of the marketing operations of these two companies in the United Kingdom and Ireland, according to reports from London.

This consolidation follows a plan for joint operations formulated by these two companies and Anglo-American Oil Co. (Standard Oil Co. of New Jersey) following the recent abandonment of the gold standard in Great Britain.

Details surrounding the operation of the new company, which will consolidate the purchasing, distributing and marketing facilities of Shell-Mex and British Petroleum, are not yet available.

ATLANTIC ENLARGES TERMINAL

NEW YORK, Nov. 7.—Atlantic Refining Co. has completed plans for dredging the James River in the vicinity of the company's new pier on the east bank of the river below Norfolk.

IMPROVE MARKETING CONDITIONS IN ROCKY MOUNTAIN TERRITORY

By W. H. Ferguson
Vice President, Continental Oil Co.*

The practice of loaning equipment has never, so far as I know, prevailed in the Pacific Coast states. Retailers there have always been required to buy the equipment, although manufacturers and jobbers have been willing to sell it to them on "conditional sales" contracts, and have to that extent assisted in financing the dealers. With the overproduction of crude oil and gasoline in California in recent years, a number of California distributors have sought additional markets for their products in the bordering Rocky Mountain states; and some of the distributors along the western boundary of the Rocky Mountain territory have, in turn, moved into the Pacific Coast territory. It was quite natural for the same division offices supervising the distribution of petroleum products in eastern Washington and Oregon and western Montana to reflect on the fact that they were selling pumps and tanks in Washington and Oregon and loaning them, or in fact giving them away, to dealers in Montana. An interchange of views logically followed. No good reason presented itself why the dealers in Montana should not also have to pay for their equipment. The state code committee furnished a convenient forum for a discussion of the matter, because at the monthly meetings there were present representatives of practically all of the marketers, both large and small. More than a year ago the Montana marketers at one of their monthly code meetings concluded to try the experiment of abolishing in the State of Montana the furnishing of equipment, both under "loan" and "conditional sales" agreements.

At first, I believe there was a rather hazy idea as to the authority and jurisdiction of the state code committee, as such, to initiate such a movement. After consultation and further conferences, however, the committee reached, as I see it, a solid justification for taking this initiative. Rule 1 of the code, both as originally adopted and recently reaffirmed, provides:

"The practice of loaning or leasing gasoline pumps, tanks, and other equipment is unsound and uneconomic, and should be discontinued at the earliest possible moment consistent with existing conditions."

It is immaterial whether this rule be regarded as a Group 1 rule or a Group 2 rule. It has received the stamp of approval of the American Petroleum Institute and the Federal Trade Commission. The code, of course, could not be amended by the action of a state committee. However, it was certainly a warranted activity of any state committee to assist in bringing about the discontinuance of a practice which the code itself states should be discontinued at the earliest possible moment. Consequently, the committee by resolution recommended the discontinuance of the practice in the State of Montana. Any individual marketer, whether a signer of the code or not, was, of course, at liberty to do as he pleased. The ultimate effect of the recommendation, however, necessarily depended upon the practically unanimous concurrence of all of the marketers in the State within

(Continued on Page 127)

*Part of paper presented at annual meeting, American Petroleum Institute, Chicago.

BULK OF PLANT SALES THROUGH BULK OUTLETS

WASHINGTON, D. C., Nov. 7.—"Nearly two-thirds of the value of the sales of all petroleum products by manufacturing plants included in the petroleum refining industry are made to the refiners' own wholesale branches," states the Census Bureau in a report just made public.

Of the total sales by these plants in 1929 amounting to $2,639,665,000, 60.3 per cent, or $1,592,553,000, was sold in this way.

Other sales made to wholesalers were 18.3 per cent, or $484,102,000; to industrial consumers such as manufacturers, bus lines, steamship companies, 8.6 per cent, or $225,988,000; to refiners' own retail branches, 7.6 per cent, or $200,144,000; and to retailers, 5.2 per cent, or $136,878,000.

Of the sales to dealers and industrial consumers, $62,901,000 were made through manufacturers' agents, selling agents or brokers. Sixty-one plants sold through such agents, seven of them selling their entire output in this way.

This report includes the sales channels used by 390 plants engaged primarily in refining crude petroleum by distillation.—C. E. K.

ORGANIZE MARKETING COMPANY

Mullin-Uhlman Co., Longview, Tex., is a newly organized Texas corporation engaging in the marketing, gathering and loading into tank cars of crude in East Texas. It has a contract with Chalmette Petroleum Corp., of New Orleans, for requirements of East Texas crude oil up to 3,500 bbls. a day.

UNION HAS SUBSIDIARY

LOS ANGELES, Calif., Nov. 9.—The Union Oil Co. has formed a subsidiary, Union Service Stations, Inc., to take over the company's Pacific Coast service stations. The new company has an authorized capitalization of 50,000 shares of $100 par common stock of which 17,007 shares will be issued. All outstanding stock will be owned by the parent company. The directors of the subsidiary company are L. P. St. Clair, president; R. D. Matthews, V. H. Kelly and A. C. Galbraith, vice presidents; J. D. Dasteel, manager. The Union service stations were formerly leased to individuals and the present move is to return the stations to one group and segregate the retail division from the wholesale operations. The Standard Oil Co. of California operates its stations under a similar plan, its marketing subsidiary being the Standard Stations, Inc.

STAR BUY CRUDE SUPPLY

FORT WORTH, Tex., Nov. 9.—The Star Refining Co. of Fort Worth has purchased 450,000 bbls. of oil from the Continental Oil & Gas Co. in the Goldsboro Pool, Coleman County, which is to be delivered at Fort Worth at the rate of 1,000 bbls. per day. Price paid for the oil was 66 cents per barrel. Freight charges to Fort Worth amounts to 32 cents per barrel.

CONSIDER CO-OPERATIVE PLANT

CHATHAM, Ontario, Nov. 7.—Independent oil operators in the Turner Valley Field have been approached with reference to the organization of a refining company on a co-operative basis.

GARBER REFINERIES TO BUILD REFORMING UNIT

The Garber Refineries, Inc., operating a refinery at Garber, Okla., has completed plans for the construction of a reforming unit which will supplement the operation of the present crude oil topping and cracking equipment. The new unit which will be installed by the Winkler-Koch Engineering Co. of Wichita, Kans., will have sufficient capacity to reform the present gasoline capacity of the refinery in order to raise the antiknock properties of the finished motor fuel. The plant has a capacity of 3,000 bbls. of crude oil daily and usually averages around 3,500 bbls., daily.

The Garber refinery for several years has operated with high gravity crude oil secured from the Garber, Okla., field. The yield of straightrun gasoline is approximately 50 per cent. The refinery also has equipment to crack gas oil. With the new unit the company expects to reform all the straightrun gasoline cut having boiling points in excess of 300° F. The kerosene cut can also be included if desired. The average octane rating of the plant's gasoline production can be increased to 68 or 70.

The Garber company is the first of Mid-Continent independent refinery operators to complete plans for the construction of reforming units. Several other owners are planning to add similar equipment within the next few months.

PLAN REORGANIZATION OF COSDEN COMPANIES

ABILENE, Tex., Nov. 9.—Federal Judge James C. Wilson has refused to grant a request of the Credit Alliance Corp. of New York that cracking stills at the Big Spring refinery of the Cosden Oil Co. be ordered shut down.

The complainant, claiming the Cosden company, which is in receivership, owes it $439,000, contended that operation of the stills accelerated deterioration and thereby depreciated value of notes it holds. The notes were given the Graver Corp. by the Cosden company to secure payment for the stills, the former transferring the paper to the complainant. The stills are of the cracking type.

In rendering his decision on the motion asking a shutdown Judge Wilson, who had heard the testimony showing that the properties had shown an operating profit of $288,000 since July 31, and that the receivers, Henry Zweifel and George Moore, had on hand $114,000 cash on that date, declared that "it is astounding to learn the properties are being operated profitably under conditions existing in the oil industry" and that the shutdown would be "out of the question."

The court was told that J. S. Cosden, with H. B. Gutelius of the Continental Supply Co., one of the largest creditors, had perfected a plan for reorganization of the company, and termination of receivership and that the plan would be ready for submission to creditors in a few weeks.

The court said that testimony showed the plant was deteriorating rapidly and that the complainant deserved some relief. The court decided to work out a plan himself whereby the receivers will set aside a special fund to offset depreciation pending termination of the foreclosure proceedings instituted by the Credit Alliance Corp., which have not been heard.

Testimony showed that the refinery here is refining 4,500 bbls. of gasoline daily and that book value of properties in receivership is more than $10,000,000 against balance sheet liabilities of about $4,000,000.

Manufacture of Natural Gasoline

UNITED GAS BUILDING PLANT AT REFUGIO, TEX.

HOUSTON, Tex., Nov. 9.—The United Gas Co. is dismantling one of its two gasoline plants at Waskom, Tex., and is moving the equipment to Refugio. In the latter field, the equipment is being set up adjoining the booster station of the Houston Gulf Gas Co., gas transportation subsidiary of the United Gas System, and will be put in operation soon after the middle of November.

The plant at Refugio will have a capacity of 50,000,000 feet of gas daily and as the gas runs approximately 1,000 gallons per 1,000,000 feet, the plant will have a daily output of 50,000 gallons daily at capacity. The production will consist mostly of Grade AA gasoline.

Although potential gas production of Refugio Field is upward of 500,000,000 feet daily, no gasoline plants have ever been built before. Another plant was planned several months ago but was not built. The field supplies several trunk gas line systems which pipe gas to all parts of south and southwest Texas, including Houston, San Antonio and other such cities. The lean gas from the new gasoline plant will be turned into the lines of the Houston Gulf Gas Co.

United Production Corp., one of the subsidiaries of the United Gas System, is the largest producer and operator in the Refugio district, and gathering lines of the Houston Gulf Gas Co. cover all parts of the field.

The equipment, which is being moved from Waskom, has not been used for some time as only one plant has been needed by the company in that field. The extra plant was a part of the holdings of the Magnolia Gas Co., which was acquired several years ago by the United Gas Co., and as the latter company already had a large plant, gasoline extraction was centralized in one plant and the other plant was shut down.

PLANTS IN EAST TEXAS OPERATE PART CAPACITY

HOUSTON, Tex., Nov. 9.—Humble Oil & Refining Co. the past week put in operation the first of its two large combination repressuring and gasoline extraction plants in East Texas. This plant is the one on the London block between the Kilgore and Joiner Fields. The other plant, the one on the Bateman or Kilgore block, will be completed this week and put on the line.

The London plant has a capacity of 10,000,000 feet of gas daily, having a total of 3,160 horsepower, consisting of seven 200 horsepower and sixteen 100 horsepower united with one 160 horsepower auxiliary unit. Since completion the plant has been running only at about one-third capacity with a yield of approximately 4 gallons per 1,000 feet.

Stabilizing equipment so far has not been completed but probably will be ready for operation by the last of the week.

Although the London plant was designed primarily for repressuring, so far no repressuring has been undertaken on the 4,000-acre block on which it is located. Under the restricted production of the field, it is probable that fuel needs of the company will require all the lean gas available.

The Kilgore plant, which also is virtually completed, will have a capacity of 5,000,000 feet daily with four 80 horsepower and eight 160 horsepower units and an additional 80 horsepower auxiliary unit.

IMPORTANT CHANGES UNDER WAY IN PRODUCTION OF NATURAL GASOLINE

The trend of natural gasoline production, consistently upward since its beginning, showed a marked reversal in 1930 when the output failed to surpass the 1929 total. The production in 1930 amounted to 2,210,494,000 gallons as compared with 2,233,688,000 gallons in 1929, a decrease of 1.0 per cent, according to the U. S. Bureau of Mines, Department of Commerce. In spite of this decline, the United States still ranks far ahead of the other nations in natural gasoline production. In 1929, the latest year for which complete world figures now are available, the United States produced 91 per cent of the world total. However, the proportion produced by the other countries, while small, has grown steadily.

Natural gasoline is unique in that its production is influenced chiefly by the output of crude oil, says G. R. Hopkins, in a statement just made public by the Bureau of Mines. This is because the supply of natural gas, the raw material, fluctuates with the activities in the crude oil fields. In 1930 the output of crude was considerably below the record total of 1929, hence the production of natural gasoline at the majority of those plants which operate on "wet" or casinghead gas was reduced. On the other hand, the demand for natural gas to supply the large pipe line systems increased in 1930, and since this gas is usually treated before it is turned into the pipe lines, the output of natural gasoline rose accordingly. Thus the increase in production of natural gasoline in the Texas Panhandle area, the point of origin for a number of large pipe lines, largely compensated for the decline in output at Seminole, the largest producing district, and a "wet" gas area. The trend of natural gasoline prices, which ordinarily does not exert much influence on production, had a tendency to materially restrict the output of natural gasoline in 1930. This was because the price fell to such low levels that many of the small manufacturers were forced to cancel their gas contracts and most of the large companies curtailed the construction of new plants. Another factor in the decline in production in 1930 was the drop in yield due to a growth in stabilization. To meet the new specifications for natural gasoline, the manufacturers have found it necessary to do more stabilizing, which means that what formerly comprised the lightest ends of their product must now be utilized in some other way.

California, with a production of 829,713,000 gallons in 1930, was again the leading producing state. Oklahoma, with a production of 591,194,000 gallons, was second; and Texas, with 491,299,000 gallons, was third. These three states rank far ahead of the others as regards the output of natural gasoline; in fact, they produced 87 per cent of the total for the country in 1930. The only important change in rank of the producing states in 1930 was the displacement of West Virginia, which ranked fourth in 1929, by Louisiana. This resulted both from an increase in output in Louisiana and from a decline in West Virginia, and reflects principally the increased demand for gas by pipe lines leading from the Monroe and Richland Fields of Louisiana. The majority of the less important producing states reported a decrease in output in 1930; the most notable exceptions were New Mexico and Wyoming. In New Mexico the development of large oil and gas fields in the southeast corner of the state led to a gain in output, whereas the output of natural gasoline in Wyoming was considerably augmented through the practice of introducing residue gas into the producing sands at Salt Creek.

Number of Plants

There has been a steady decline in the number of natural gasoline plants in recent years but the total capacity of the plants has shown a consistent gain. The number of plants which operated in 1930 totaled 1,035, which compares with 1,087 operated during 1929 and with the record total of 1,119 operated during 1927. The next biennial survey of natural gasoline plants will not be made by the bureau until January 1, 1932, hence very little data as to the capacity of the plants are available for 1930. However, it is believed that the total capacity as of December 31, 1930, was approximately 11,500,000 gallons daily, a gain over the previous year of about 9 per cent. California showed the largest gain of any state in capacity in 1930. This resulted chiefly from the construction of a number of large plants in the Kettleman Hills Field. The Panhandle district of Texas experienced some plant expansion in 1930. Oklahoma showed a loss in number of plants in 1930 but continued to rank well ahead of the other states in this respect. Next to Oklahoma in number of plants operated in 1930, in order of rank, were California, Texas, and Pennsylvania. The plants in Pennsylvania are of small capacity, hence the output of the state is equivalent to only a fraction of the output in the other two states.

The number of operators, or companies, operating natural gasoline plants has declined steadily in the past few years. This has resulted both from the decrease in number of plants cited above and from mergers, many of which were forced on the operators when natural gasoline prices fell to below the cost of production. The average natural gasoline company operates three plants but there are a few companies which operate more than 25.

Average Yield

The average yield of natural gasoline per thousand cubic feet of gas treated fell from 1.14 gallons in 1929 to 1.06 gallons in 1930. This marks the second successive year in which the yield of natural gasoline has declined, which follows a long period of increasing recovery. Practically all of the states showed a lower yield in 1930; the most notable exception was Wyoming, where the yield rose from 1.34 in 1929 to 1.73 in 1930. Arkansas continued to report the highest natural gasoline yield of any state, although its yield dropped from 2.87 in 1929 to 2.64 in 1930. The principal cause of the widespread decline in yields in 1930 was the growth of stabilization, which cut down the volume produced through the elimination of the lighter ends. A minor cause was the growth in relative importance of the Texas Panhandle, a "dry" gas district with a comparatively low yield.

The number of plants using the compression and charcoal processes continued to decline in 1930. The number of plants using the absorption process, or a combination of the absorption process and the compression or charcoal processes, also declined, the first ever recorded. The major portion of the output continued to be produced by the absorption process, with the compression process next in importance, and the charcoal process a poor third.

The production of natural gasoline in 1930 reached its peak during the month of February, when the daily average output amounted to 6,480,000 gallons. Except for a brief period of increased output in October and November, the trend of production was consistently downward from February until the end of the year.

During 1930 natural gasoline was produced in 157 counties in 16 states. Compared with 1929 this represents the same number of producing states but a decline of 4 in number of counties. Although the output of Los Angeles County, California, declined materially in 1930, it easily retained first place among the producing counties. Seminole County, Oklahoma, was again second, but Ventura County,

(Continued on Page 135)

MAINTENANCE OF PUMPS IN PLANT OPERATION

The proper care of pumps not only lengthens the life of this equipment in gasoline plants but it also assures efficiency in plant operation according to an article in the current issue of the Booster, official publication of the Standard Gasoline Co., largest manufacturer of natural gasoline in California. Various types and sizes of pumps are used at gasoline plants and all require care to secure the best operating results.

The following questions each requiring a "yes" answer on the part of plant operators are given by the publications as the points to be watched in the care of pumps:

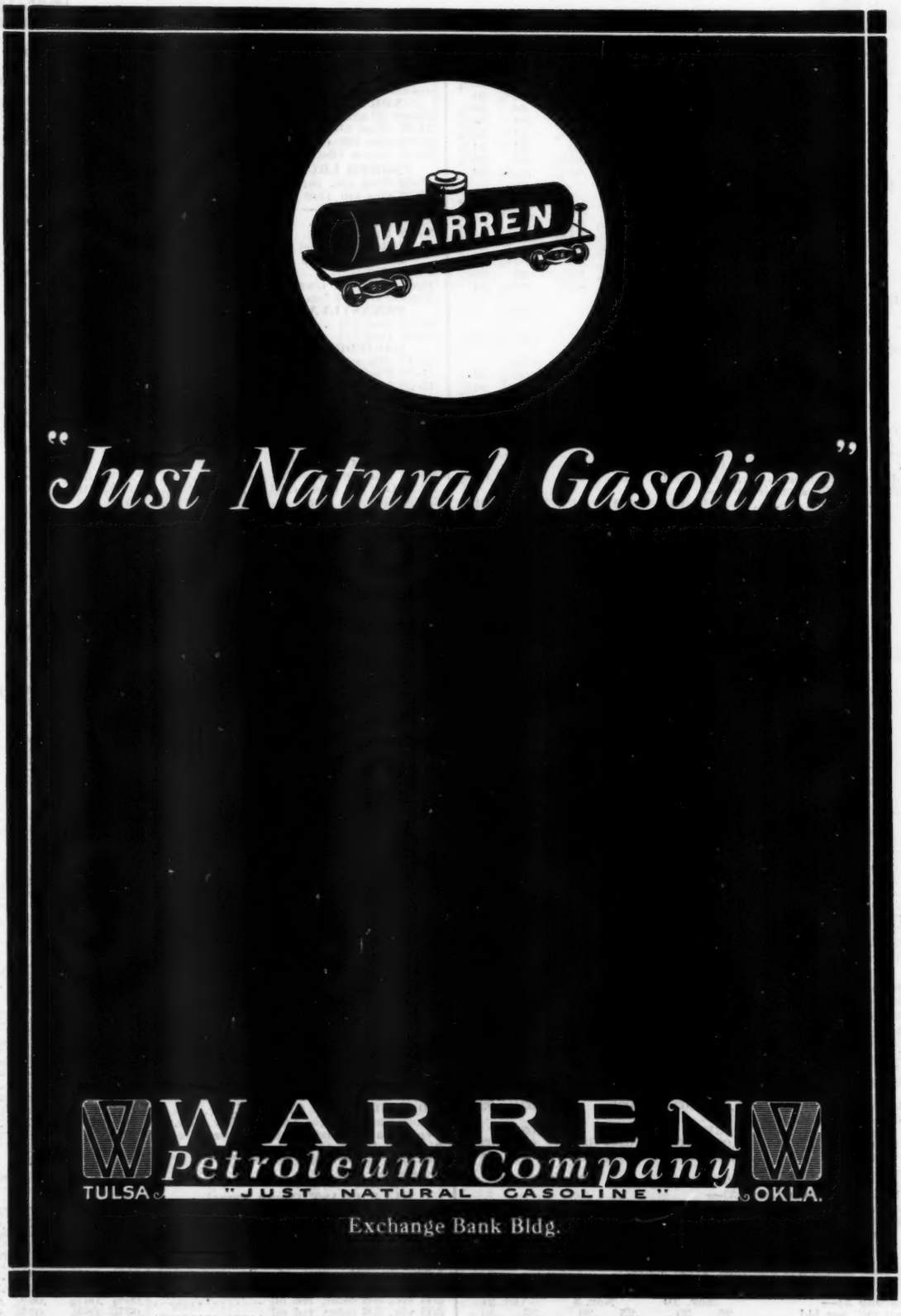
1. Are all bearing points protected from sand and dust and provided with lubrication?
2. Is a small amount of steam cylinder oil fed at regular intervals to lubricate the steam valves and piston of reciprocating steam pumps?
3. Are the steam valves set so as to provide smooth stroking and cushioning at the end of each stroke?
4. Are your pumps properly packed?
5. Are the pump rods, shafts, or plungers smooth and straight?
6. Is care used to prevent tool marks being made on pump rods?
7. Are port valves in good order to facilitate priming when the pump is started?
8. Is the suction line open and unrestricted allowing the fluid end to fill completely each stroke?
9. Are thrust collars properly set to prevent the runner stroking the volute?
10. Is the belt pulley of your centrifugal pump round and true to prevent vibrations?
11. Are triplex pump gears lubricated continuously?
12. Are triplex pump gears well guarded, particularly where the teeth mesh?
13. Are your fluid end valves in good condition, preventing leakage?
14. Is the impeller of your centrifugal pump in good condition?
15. Are foundation bolts tight?
16. Are your belt driven pumps in line so that the belts run on the crown of the pulleys?

BUILDING EAST TEXAS PLANT

DALLAS, Tex., Nov. 9.—The Lisbon Gasoline Co. is building an eight-unit gas compressor station and gasoline plant on the E. E. Moore lease in the Cadene Survey of Rusk County in the East Texas Field. Gas will be supplied from the Mid-Kansas Oil & Gas Co. and other wells in the Joiner Pool. O. J. Dykes, president of the company formerly operated plants in the North Louisiana fields.

START SUNRAY PLANT

C. H. Wright, receiver for the Sunray Oil Co., has started operating the new 10,000-gallon absorption natural gasoline plant at Sunray, Tex., in Moore County. Construction work was completed late in October and the initial run was made November 1.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"Just Natural Gasoline"
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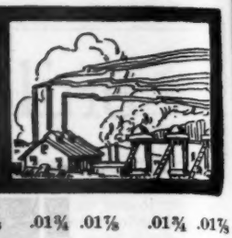
REFINERY AND CRUDE PRICES

Quotations on refined products are for interstate or export movement unless otherwise noted.



GASOLINE AND NAPHTHA

OKLAHOMA (Group 3)—	Nov. 10		Nov. 3		Oct. 27	
50-52 450 endpoint	.04¼		.04		.03½	.03¾
56-58 450 endpoint	.04¼		.04¼		.03¾	.04
58-60 437 endpoint (U. S. Motor)	.04½	.04¾	.04½	.04⅝	.04	.04½
60-62 437 endpoint	.04½	.04¾	.04½	.04⅝	.04	.04½
60-62 400 endpoint	.04⅝	.04⅞	.04⅝	.04¾	.04¼	.04⅝
64-66 375 endpoint	.05⅛	.05¼	.04⅞	.05	.04⅞	.04⅝
68-70 360 endpoint	.05¼	.05½	.05¼	.05½	.05	.05¼
64-66 437 endpoint (blend)	.04½	.04¾	.04	.04¼	.03¾	.04
NORTH TEXAS—						
50-52 450 endpoint	.04¼		.04		.03½	.03⅝
58-60 450 endpoint	.04¼		.04	.04⅛	.03⅝	.03⅝
58-60 437 endpoint (U. S. Motor)	.04⅜	.04½	.04⅛	.04⅜	.04	.04⅛
60-62 400 endpoint	.04½		.04⅛	.04⅝	.04	.04⅛
64-66 390 endpoint	.04¾	.04⅞	.04⅝	.04¾	.04½	.04⅝
64-66 375 endpoint	.05	.05⅛	.04¾	.05	.04⅝	.04¾
68-70 360 endpoint	.05⅛	.05¼	.05⅛	.05½	.05	.05¼
64-66 437 endpoint (blend)	.04¼	.04½	.04	.04¼	.03¾	.04
***NORTH LOUISIANA—**						
58-60 437 endpoint (U. S. Motor)	.05		.04½		.04¼	
***ARKANSAS—**						
58-60 437 endpoint (U. S. Motor)	.05		.04½		.04¼	.04⅜
PENNSYLVANIA—						
52-54 Naphtha	.04½		.04½		.04½	
54-56 Naphtha	.04½	.04½	.04½	.04½	.04½	.04½
58-60 Gasoline	.04½	.04¾	.04½	.04¾	.04½	.04⅝
60 Gasoline	.04¾	.05	.04¾	.05	.04¾	.05
62 Gasoline	.05	.05¼	.05	.05¼	.05	.05¼
64 Gasoline	.05¼	.05¾	.05¼	.05¾	.05¼	.05¾
68-70 350 endpoint gasoline	.05½	.06	.05¾	.06	.05¾	.06
CALIFORNIA—						
†54-58 437 endpoint (U. S. Motor) domestic	.05½	.06½	.05½	.06¾	.05¾	.06¾
58-60 400 endpoint domestic gasoline	.06	.07¼	.06	.07¼	.06¼	.07¼
CHICAGO DISTRICT (Based on Group 3)—						
50-52 450 endpoint (Naphtha)	.04⅜	.04½	.04	.04¼	.03⅞	.04
58-60 437 endpoint (U. S. Motor)	.04½	.04¾	.04½	.04½	.03⅞	.04½
60-62 400 endpoint	.04¾	.05	.04½	.04⅝	.04	.04½
64-66 375 endpoint	.05	.05⅛	.04¾	.05	.04⅜	.04⅝
68-70 360 endpoint	.05¼	.05½	.05⅛	.05¼	.04⅝	.05
64-66 437 endpoint (blend)	.04½		.04		.03¾	.04
GULF COAST (Export)—						
58-60 U. S. Motor	.03⅞	.04	.03¾	.03⅞	.03¾	.04
60-62 400 endpoint	.04⅛		.04½		.04¼	
61-63 390 endpoint	.04¼		.04½		.04½	
64-66 375 endpoint	.04½		.04½		.04½	

*Louisiana, Arkansas and Mississippi delivery. †For Pacific Coast consumption.

NATURAL GASOLINE

OKLAHOMA (Group 3)—	Nov. 10		Nov. 3		Oct. 27	
Grade A, 72-79.9, 375 e.p., rec. 90%	.04¾	.04⅞	.04¾		.04¾	
Grade AA, 80-87.9, 375 e.p., rec. 90%	.04½	.04¾	.04⅝	.04¾	.04¾	
Grade B, 76-83.9, 375 e.p., rec. 85%	.04½	.04¾	.04⅝	.04¾	.04¾	
Grade BB, 84-92, 375 e.p., rec. 85%	.04½	.04¾	.04⅝	.04¾	.04¾	
Grade C, 80-92, 375 e.p., rec. 78%	.04½	.04¾	.04⅝	.04¾	.04¾	
NORTH TEXAS—						
Grade A, 72-79.9, 375 e.p., rec. 90%	.04⅝		.04⅝		.04¾	
Grade AA, 80-87.9, 375 e.p., rec. 90%	.04½	.04⅝	.04⅝	.04½	.04⅝	
Grade B, 76-83.9, 375 e.p., rec. 85%	.04½	.04⅝	.04⅝	.04½	.04⅝	
Grade BB, 84-92, 375 e.p., rec. 85%	.04½	.04⅝	.04⅝	.04½	.04⅝	
Grade C, 80-92, 375 e.p., rec. 78%	.04¼	.04⅝	.04⅝	.04½	.04⅝	
NORTH LOUISIANA—						
Grade AA, 80-87, 375 e.p., rec. 90%	.04¾		.04¾		.04¾	
Grade BB, 84-92, 375 e.p., rec. 85%	.04¾		.04¾		.04¾	
Grade C, 80-92, 375 e.p., rec. 78%	.04¾		.04¼		.04¼	
CALIFORNIA—						
75-78 375-390 endpoint	.05¼	.06½	.05¼	.06¼	.04¾	.05½
CHICAGO DISTRICT (Based on Group 3)—						
Grade A, 72-79.9, 375 e.p., rec. 90%	.04¾		.04½	.04¾	.04¾	
Grade AA, 80-87.9, 375 e.p., rec. 90%	.04½		.04½		.04¼	
Grade BB, 84-92, 375 e.p., rec. 85%	.04½		.04½		.04¼	

BURNING OIL

OKLAHOMA (Group 3)—	Nov. 10		Nov. 3		Oct. 27	
41-43 water white kerosene	.02⅛	.02¼	.02	.02¼	.02	.02¼
42-44 water white kerosene	.02¼	.02⅜	.02⅛	.02⅜	.02⅛	.02⅜
NORTH TEXAS—						
41-43 water white kerosene	.02	.02⅛	.02	.02⅛	.02⅛	
40-41 water white kerosene	.02		.02		.02	
***NORTH LOUISIANA—**						
41-43 water white kerosene	.02¾	.03	.02¾		.02½	.02¾
***ARKANSAS—**						
41-43 water white kerosene	.02¾	.03	.02¾		.02½	.02¾
PENNSYLVANIA—						
43 Kerosene prime white	.03½		.03½		.03½	
45 Kerosene water white	.03⅝	.03¾	.03⅝	.03¾	.03⅝	.03¾
46 Kerosene water white	.03⅞	.04	.03⅞	.04	.03⅞	.04
CALIFORNIA—						
38-40 water white Kero. (high burning test)	.04	.05	.04	.05	.04	.05
CHICAGO DISTRICT (Based on Group 3)—						
41-43 water white kerosene	.02⅛	.02¼	.02	.02⅛	.02	.02⅛
42-44 water white kerosene	.02¼	.02½	.02⅛	.02⅜	.02⅛	.02⅜
GULF COAST (Export)—						
41-43 water white	.03¾		.03¾		.03¾	
44 prime white	.03½		.03½	.03¾	.03½	.03¾

*Louisiana, Arkansas, Mississippi and East Texas delivery.

FUEL OIL

OKLAHOMA (Group 3)—	Nov. 10		Nov. 3		Oct. 27	
Below 18 gravity Fuel Oil, per bbl.	.25	.30	.25	.30	.25	.30
18-22 Fuel Oil, per bbl.	.30	.35	.30	.35	.30	.35
20-22 Fuel Oil, per bbl.	.32½	.37½	.32½	.37½	.32½	.37½
22-26 Fuel Oil, per bbl.	.35	.40	.35	.40	.35	.40
24-28 Fuel Oil, per bbl.	.40	.45	.40	.45	.40	.45
26-30 Fuel Oil, per bbl.	.45	.50	.45	.50	.47½	.50
28-30 Fuel Oil, per bbl.	.50	.55	.50	.55	.50	.55
32-36 Gas Oil (industrial)	.01⅝	.01½	.01⅝	.01½	.01⅝	.01½
32-36 Gas Oil (straw color, high cold test)	.01¼	.01⅝	.01⅝	.01½	.01⅝	.01½
32-36 Gas Oil (straw color, low cold test)	.01⅝	.01¾	.01⅝	.01¾	.01⅝	.01¾
36-38 Distillate	.01¾		.01¾		.01¾	
38-40 Straw Distillate	.01¾	.01⅞	.01¾	.01⅞	.01¾	.01⅞

Note—Fuel oils over 40 cold test generally 5 to 10 cents per barrel less when available.

NORTH TEXAS—						
Below 20 gravity Fuel Oil, per bbl.	.35	.45	.35	.45	.35	.40
24-26 Fuel Oil, per bbl.	.40	.45	.40	.45	.40	.45
32-36 Gas Oil (industrial)	.01¼	.01⅜	.01¼	.01⅜	.01¼	.01⅜
38-40 Straw Distillate	.01⅝	.01¾	.01⅝	.01¾	.01⅝	.01¾
***NORTH LOUISIANA—**						
18-20 Fuel Oil, per bbl.	.40	.50	.40	.50	.40	.50
30-32 Gas Oil (low cold test)	.02		.02		.01¾	.02
***ARKANSAS—**						
33-36 Distillate	.02		.01¾	.02	.01¾	.02
30-32 Gas Oil	.01¾	.02	.01¾		.01¾	
16-22 Refinery Fuel Oil, per bbl.	.35	.50	.35	.50	.35	.50
GULF COAST (South Texas)—						
Gas Oil	.02¼	.02½	.02¼	.02½	.02¼	.02½
Bunker C Fuel (cargo lots), per bbl.	.40	.45	.40	.45	.40	.45
Bunker C Fuel (small lots)	.45		.45		.45	
PENNSYLVANIA—						
30-34 Gas Oil	.02⅝		.02¾		.02¾	
36-40 Gas Oil	.02⅝	.02¾	.02¾	.03	.02¾	.03
CALIFORNIA—						
42-45 480 endpoint engine distillate	.07	.08	.06¾	.07¾	.06¾	.07¾
15-19 Fuel Oil, Bunker (at tidewater), bbl.	.60	.80	.60	.80	.60	.80
15-19 Fuel Oil, cargo lots (tidewater), bbl.	.55	.75	.55	.75	.55	.75
†15-19 Fuel Oil (f.o.b. tank cars), bbl.	.45	.75	.45	.75	.45	.75
27 plus Diesel, per bbl.	.80	.95	.80	.95	.80	.95
30-34 Gas Oil	.75	.95	.80	.95	.80	.95
CHICAGO DISTRICT (Based on Group 3)—						
18-22 Fuel Oil, per bbl.	.32½	.37½	.30	.35	.30	.35
22-26 Fuel Oil, per bbl.	.37½	.42½	.35	.40	.35	.40
28-30 Fuel Oil, per bbl. (zero)	.52½	.57½	.50	.55	.50	.55
32-36 Gas Oil (industrial)	.01⅝	.01¾	.01½	.01⅝	.01½	.01⅝
32-36 Gas Oil (zero)	.01¾	.02	.01⅝	.01⅞	.01⅝	.01⅞
38-40 Straw Distillate	.01⅞	.02⅛	.01¾	.02	.01¾	.02

*Louisiana, Arkansas, Mississippi and East Texas delivery. †Lowest priced fuel oil has high sulphur content.

LUBRICATING OIL AND WAX

OKLAHOMA (Group 3)—	Nov. 10		Nov. 3		Oct. 27	
100 vis., 2 color, 20-25 cold test	.04½	.04¾	.04½	.04¾	.04½	.04¾
100 vis., 3 color, 20-25 cold test	.04	.04½	.04	.04½	.04	.04½
150 vis., 3 color, 20-25 cold test	.06¾	.07¼	.06¾	.07¼	.06¾	.07¼
150 vis., 4 color, 20-25 cold test	.06¼	.06½	.06¼	.06½	.06¼	.06½
180 vis., 3 color, 23-28 cold test	.08¼	.08¾	.08¼	.08¾	.08¼	.08¾
180 vis., 4 color, 23-28 cold test	.07¾	.08¼	.07¾	.08¼	.07¾	.08¼
180 vis., 5 color, 23-28 cold test	.07¼	.07½	.07¼	.07½	.07¼	.07½
200 vis., 3 color, 23-28 cold test	.09½	.10	.09½	.10	.09½	.10
200 vis., 4 color, 23-28 cold test	.09	.09½	.09	.09½	.09	.09½
200 vis., 5 color, 23-28 cold test	.08¼	.08½	.08¼	.08½	.08¼	.08½
240 vis., 3 color, 25-30 cold test	.11	.11¼	.11	.11¼	.11	.11¼
240 vis., 4 color, 25-30 cold test	.10¼	.10¾	.10¼	.10¾	.10¼	.10¾
240 vis., 5 color, 25-30 cold test	.09¾	.10	.09¾	.10	.09¾	.10
280 vis., 3 color, 25-30 cold test	.12½	.13	.12½	.13	.12½	.13
280 vis., 4 color, 25-30 cold test	.11½	.12	.11½	.12	.11½	.12
280 vis., 5 color, 25-30 cold test	.10¾	.11	.10¾	.11	.10¾	.11
Cylinder Stocks:						
600, steam refined, light green	.04½	.06	.04½	.06	.04½	.06
600, steam refined, dark green	.04	.05	.04	.05	.04	.05
190-200 vis., D color, Bright Stocks	.21	.22	.21	.22	.21	.22
150-160 vis., D color, Bright Stocks 0-10 c.t.	.19½	.20	.19½	.20	.19½	.20
150-160 vis., D color, Bright Stocks 10-25 c.t.	.19½		.19½		.19½	
150-160 vis., D color, Bright Stocks 25-40 c.t.	.19		.19		.19	
150-160 vis., E color, Bright Stocks	.18½	.19	.18½	.19	.18½	.19
Waxes:						
124-126 White Crude Scale Wax	.01⅝	.01⅞	.01⅝	.01⅞	.01⅝	.01⅞

All bright stock prices are for domestic movement.

PENNSYLVANIA—						
34 Neutral	.05½	.06½	.05½	.06½	.05½	.06½
34 Sundebloom	.05	.05½	.05	.05½	.05	.05½
36 Miners' Neutral	.05½		.05½		.05½	
150, 3 color	.17	.17½	.17	.17½	.17	.17½
180, 3 color	.19	.19½	.19	.19½	.19	.19½
200, 3 color	.21½		.21½		.21½	
220, 3 color	.24	.26½	.24	.26½	.24	.26½
600, steam refined	.13¾		.14	.14½	.14¼	.14½
650, steam refined	.16½		.17	.18	.18	.18½
600, Pennsylvania Flash	.18		.18	.19	.19	.20
600, E filtered	.17½		.18	.18½	.18	.18½
600, D filtered, Oil City	.23	.23½	.22	.23	.22	.23½
Pennsylvania Bright Stocks below 35 c.t.	.24	.24½	.27	.27½	.27½	
Pennsylvania Bright Stocks above 35 c.t.	.23½	.24	.26½	.27	.26½	.27
*122-124 White Crude Scale Wax	.02		.02		.02	
*124-126 White Crude Scale Wax	.02		.02		.02	

*At New York.

GULF COAST (South Texas)—						
100 vis., 2-2½ color, pale oil	.05½	.05¾	.05½	.05¾	.05½	.05¾
200 vis., 3 color, pale oil	.07½	.07⅞	.07½	.07⅞	.07½	.07⅞
300 vis., 3 color, pale oil	.08¾	.08⅞	.08¾	.08⅞	.08¾	.08⅞
500 vis., 3½ color, pale oil	.09½	.10⅜	.09½	.10⅜	.09½	.10⅜
750 vis., 3½ color, pale oil	.11⅜	.11⅞	.11⅜	.11⅞	.11⅜	.11⅞
1,200 vis., 3½ color, pale oil	.13⅞	.14⅜	.13⅞	.14⅜	.13⅞	.14⅜
2,000 vis., 4 color, pale oil	.14⅞	.15⅜	.14⅞	.15⅜	.14⅞	.15⅜
200 vis., 5-6 color, red oil	.06¾	.06⅞	.06¾	.06⅞	.06¾	.06⅞
300 vis., 5-6 color, red oil	.07½	.08⅜	.07½	.08⅜	.07½	.08⅜
500 vis., 5-6 color, red oil	.09½	.09⅝	.09½	.09⅝	.09½	.09⅝
1,200 vis., 5-6 color, red oil	.12⅞	.13⅜	.12⅞	.13⅜	.12⅞	.13⅜
2,000 vis., 6 plus color	.14⅞	.15⅜	.14⅞	.15⅜	.14⅞	.15⅜
CALIFORNIA—						
130 vis., 2½-3 color	.08¼	.08¾	.08¼	.08¾	.08¼	.08¾
200 vis., 2½-3 color	.09¼	.10¼	.09¼	.10¼	.09¼	.10¼
300 vis., 3-3½ color	.10¼	.11¼	.10¼	.11¼	.10¼	.11¼
350 vis., 3½-4 color	.11¼	.12	.11¼	.12	.11¼	.12
450 vis., 3½-4 color	.12	.12⅝	.12	.12⅝	.12	.12⅝
550 vis., 3½-4 color	.12⅝	.13¼	.12⅝	.13¼	.12⅝	.13¼

REFINERY AND CRUDE PRICES

Quotations on refined products are for interstate or export movement unless otherwise noted.

Red Neutral:						
200 vis., 4½-5 color	.09¾	.10¼	.09¾	.10¼	.09¾	.10¼
300 vis., 5-6 color	.10½	.11	.10½	.11	.10½	.11
500 vis., 4½-5 color	.12¾	.13½	.12¾	.13½	.12¾	.13½
600 vis., 6½ plus color	.13½	.14¼	.13½	.14¼	.13½	.14¼
700 vis., 6½ plus color	.14½	.15¼	.14½	.15¼	.14½	.15¼

Note—Bright stocks are not manufactured commercially on the Pacific Coast.

NEW YORK (BAYONNE) EXPORT PRICES

	Nov. 10	Nov. 3		Oct. 27	
Gaso., U.S.M., 58-60, 437 e.p., 65 O.N. (min.)	.06	.05¼	.06¼	.05½	.06¼
Gaso., U.S.M., 58-60, 437 e.p., below 65 O.N.	.05½	.05¼			
Kerosene, water white, 41-43	.05½	.05		.05	
*Fuel Oil, Bunker "C"	.70	.70		.60	
†Fuel Oil, Diesel, 28-30, per bbl.	1.40	1.40		1.30	
Gas Oil, 28 gravity plus	.04	.04		.04	
25 pale Paraffin Oil, tank car	.10¼	.10¼		.10¼	
28 pale Paraffin Oil, tank car	.07¼	.07¼		.07¼	
280 red Paraffin Oil, tank car	.12½	.12½		.12½	
250 red Paraffin Oil, tank car	.11½	.11½		.11½	
225 red Paraffin Oil, tank car	.10	.10		.10	
200 red Paraffin Oil, tank car	.09¼	.09¼		.09¼	
Domestic heating oil, min. 32 grav., tank car	.03½	.03½		.03½	
Refined Wax:					
120-122 a.m.p., per lb.	.02⅞	.02⅞		.02¾	
125-127 a.m.p., per lb.	.03	.03		.02⅞	
130-132 a.m.p., per lb.	.03½	.03½		.03⅜	
133-135 a.m.p., per lb.	.04	.04		.04	
135-137 a.m.p., per lb.	.04½	.04½		.04½	
Petrolatum in barrels in carload lots, per pound:					
Dark green	.01¾	.01¾		.01¾	
Amber	.02½	.02½		.02½	
Extra amber	.03	.03		.03	
Cream	.05½	.05½		.05½	
Lily white	.06½	.06½		.06½	
Snow white	.07	.07		.07	

*Lighterage 5 cents a barrel extra. †Lighterage 6.5 cents a barrel.

NEW YORK (BAYONNE) REFINERY PRICES

	Nov. 10		Nov. 3		Oct. 27	
600, steam refined cylinder stocks, in bbls.	.21	.22	.22	.22½	.22	.22½
635, steam refined	.22½	.23	.23½	.24	.24	.24½
650, steam refined	.24	.24½	.25	.25½	.25½	.26
600, Pennsylvania Flash	.25	.26	.26	.27	.26½	.27
630, Pennsylvania Flash	.28	.29	.30	.31	.30½	.31
600, Warren E	.24	.24½	.25	.26	.25½	.26
600, Oil City E	.23	.23½	.24	.25	.24½	.25
Light 140-150 Bright Stocks	.32	.33	.35	.36	.35½	.36
Dark 140-150 Bright Stocks	.31	.32	.34	.35	.34½	.35

LOS ANGELES EXPORT PRICES

	Nov. 10		Nov. 3		Oct. 27	
Kerosene, water white	.04	.04¾	.04	.04¾	.04	.04¾
U. S. Motor gasoline, 53-55, 437 e.p.	.04¼	.04½	.04¼	.04½	.04¼	.04¾
58-60, 400 endpoint gasoline	.04¾	.05	.04¾	.05	.04¾	.05¼

CRUDE OIL PRICES

OKLAHOMA, KANSAS, NORTH AND EAST CENTRAL TEXAS

East Texas (Nov. 2, 1931)† ..... $ .83
Corsicana heavy (Nov. 3, 1931)* ..... .49
Other fields ..... See gravity table

†Posted by Panola Pipe Line Co., Magnolia Petroleum Co., Tidal Refining Co., Sinclair Refining Co., Gulf Pipe Line Co., Atlas Pipe Line Co. *Magnolia Petroleum Co.

EASTERN STATES
Joseph Seep Purchasing Agency
(Effective November 1, 1931)

Pennsylvania Grade Oil in National Transit Lines (Bradford Field) (Oct. 15, 1931) $2.00
Pennsylvania Grade Oil in Southwest Pennsylvania Lines 1.70
Penna Grade Oil in Eureka Pipe Line Lines (West Virginia) 1.60
Penna Grade Oil in Buckeye Pipe Line Lines (Sept. 4, 1931) 1.50
Corning Grade Oil in Buckeye Pipe Line Co.'s line (Nov. 9, 1931) ..... .85
Ragland Grade Oil in Cumberland Pipe Lines (Kentucky) (Jan. 10, 1931) ..... .60
Wayne district Oil in Cumberland Pipe Lines (April 23, 1931) 1.17

Tide Water Pipe Co.
(Effective November 1, 1931)

Bradford, Pa. $2.00
Allegany, N. Y. 2.00

Pure Oil Co.
(Effective September 12, 1931)

Cabin Creek, W. Va. $1.60
Bradford Hollow, W. Va. 1.60
Kelly's Creek, W. Va. 1.60

Pennzoil Co.
(Effective October 3, 1931)

Pennsylvania Grade Oil in National Transit Lines:
Group A $1.95
Includes Cochran, Franklin, Hamilton and Doolittle districts.
Group B $1.94
Includes Titusville district.
Group C $1.93
Includes Turkey and Tidioute districts.
Group D $1.92
Includes Bear Creek and Perkey districts.
Group E $1.90
Includes Eldenau, Bull Creek, Rough Run, Carbon, Dipner, Bredin, McJunkin, Jameson, Kennerdell, Emlenton, Tiona, Lacy and Kinzua districts.
Price depends on length of pipe line haul to plant at Oil City.

TEXAS PANHANDLE

Gray County, Wheeler County and Carson-Hutchinson Counties. See gravity table

WEST TEXAS

Iatan and Westbrook. Same as North Texas
Crane, Upton, Crockett, Howard, Glasscock, Ector, Winkler and Pecos Counties* ..... $ .50
Lea County, N. Mex.‡ ..... .50
Toborg, Pecos County, Aug. 25, 1931†.. .25

*The Texas Company, November 2, 1931; Magnolia Petroleum Co., Humble Oil & Refining Co., Gulf Pipe Line Co., same day. †Shell Petroleum Corp. ‡Humble Oil & Refining Co., The Texas Company, November 2, 1931.

GULF COAST

Grade A and Grade B classifications discontinued by leading buyers .....
Jennings, La. (Nov. 2, 1931)* ..... See gravity table
Lockport, La. (Aug. 27, 1931)† ..... $ .65
See Gulf Coast gravity table
Refugio light ..... See gravity table
Refugio heavy (Nov. 2, 1931)‡ ..... .75
Markham (Nov. 2, 1931)‖ ..... .67
High Island (Nov. 2, 1931)¶ ..... .65

*Gulf Refining Co. †Vacuum Oil Co. ‡Humble Oil & Refining. §The Texas Company. ‖Gulf Pipe Line Co.

NORTH LOUISIANA AND ARKANSAS

Smackover, Ark. (all grades) (Nov. 4, 1931) ..... $ .55
Urania, Ark. ..... See note below
Bellevue, La. (June 3, 1931) ..... $ .25
Urania, La. (Nov. 2, 1931) ..... .50
Calion, Ark. (Aug. 22, 1931) ..... .52
East El Dorado, Ark. (Nov. 4, 1931) ... .55
Stephens, Ark., below 29° (August 24, 1931) ..... .41
Stephens, Ark., 29° and above (August 24, 1931) ..... .44
Other fields ..... See gravity table

Note—Smackover, all grades, Standard Oil Co. of Louisiana, The Texas Company, Gulf Refining Co., Magnolia Petroleum Co. Bellevue posted by Magnolia Petroleum Co.; Urania by H. L. Hunt, Inc., and Louisiana Oil Refining Co.; Calion by Gulf Refining Co.; East El Dorado by Gulf Refining Co.

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CRUDE OIL GRAVITY TABLE

	1 Kansas and Oklahoma	2 North and Central Texas	3 East Central Texas	4 Gray County, Texas	5 Carson and Hutchinson Counties, Texas	6 Salt Creek, Wyoming	7 North Louisiana and Arkansas	8 Gulf Coast (Tex. and La.)
Below 25 degrees	...	...	...	...	...	...	...	$.70
25-25.9 degrees	...	...	...	...	...	...	...	.71
26-26.9 degrees	...	...	...	...	...	...	...	.72
27-27.9 degrees	...	...	...	...	...	...	...	.73
28-28.9 degrees	...	...	...	...	...	...	...	.74
Below 29 degrees	$.61	$.61	$.61	...	...	$.61	$.61	...
29-29.9 degrees	.63	.63	.63	...	...	.63	.63	.75
30-30.9 degrees	.65	.65	.65	...	...	.65	.65	.76
31-31.9 degrees	.67	.67	.67	...	...	.67	.67	.77
32-32.9 degrees	.69	.69	.69	...	...	.69	.69	.78
33-33.9 degrees	.71	.71	.71	...	...	.71	.71	.79
34-34.9 degrees	.73	.73	.73	$.61	$.56	.73	.73	.80
35-35.9 degrees	.75	.75	.75	.63	.58	.75	.75	.81
36-36.9 degrees	.77	.77	.77	.65	.60	.77	.77	.82
37-37.9 degrees	.79	.79	.79	.67	.62	.79	.79	.83
38-38.9 degrees	.81	.81	.81	.69	.64	.79	.79	.84
39-39.9 degrees	.83	.83	.83	.71	.66	.79	.79	.85
40 degrees and over	.85	.85	.85	.73	.68	.79	.79	.86

The Magnolia Petroleum Co., which pays a flat price in every field in which it purchases oil, posted the following price notice: "Effective November 2, 1931, at 7 a.m. and until further notice our prices on crude oil will be as follows at the wells: North and North Central Texas, which includes only Burkburnett, Archer, Stephens, Henrietta, Electra, Comanche and Olden, 83 cents; Central Texas, which includes only Mexia, Wortham, Corsicana light, Panola County and Lytton Springs, 79 cents; East Texas district, 83 cents; West Texas, which includes Winkler, Crane, Upton, Howard, Glasscock and Mitchell Counties, 50 cents; Panhandle district of Texas: Gray County, 73 cents; Carson and Hutchinson Counties, 66 cents; Southwest Texas: Mirando, 75 cents; Darst Creek, 60 cents; Corsicana heavy and Luling, 49 cents. Oklahoma: Cushing, Yale, Oklahoma City, Morrison, Wewoka, Seminole, 83 cents; Cement, Duncan and Walters, 75 cents; Hewitt and Graham, 67 cents; Healdton, 52 cents.

The Magnolia Petroleum Co. made the following announcement applying to North Louisiana and Arkansas: "Effective November 4, 1931, at 7 a.m., and until further notice our prices on crude oil in the States of Louisiana and Arkansas will be as follows per barrel at the wells: Louisiana—Bull Bayou, 83 cents; Haynesville, 65 cents; Pine Island, 73 cents; Cotton Valley, 61 cents. Arkansas—El Dorado, 63 cents; Rainbow, 63 cents; El Dorado East Field, 55 cents; Smackover, 55 cents.

The White Eagle Oil Corp., effective November 2, posted the following prices in Kansas: Group 1—Eastborough, Wright, Robbins, Greenwich, Lorena and North Greenwood Pools, 85 cents; Group 2—Eastman, Fox-Bush and Keighly, 83 cents; Group 3—Smock, Sluss, Leon-Weaver, Peabody and Rock, 81 cents; Group 3A—Ritz-Canton, 79 cents; Group 4—Urschell, Florence, Elbing, Nuttle-Koogler, 77 cents; Augusta, 77 cents; Group 5—Gelwick, 61 cents.

Column 1—Led by Continental Oil Co., effective November 2, and adopted by other purchasers on same day, excepting that the Carter Oil Co., Gypsy Oil Co. and Pure Oil Co. started their schedule at below 25 degrees, 53 cents; 25 degrees, 55 cents, with 2 cents added for each degree upward to 40 degrees and above at 85 cents.

Column 2—Led by Continental Oil Co., effective November 2, and followed on same day by other purchasers.

Column 3—Led by Humble Oil & Refining Co., effective November 2.

Column 4—Led by The Texas Company, November 2, followed by Humble Oil & Refining Co., Gulf Pipe Line Co. and H. F. Wilcox Oil & Gas Co. same day.

Column 5—Led by The Texas Company, November 2, followed on same day by Humble Oil & Refining Co. and Gulf Pipe Line Co.

Column 6—Mid West Refining Co., November 2.

Column 7—Standard Oil Co. of Louisiana, November 4, 1931; The Texas Company, Gulf Refining Co. and Louisiana Oil Refining Co. same day.

Column 8—Led by The Texas Company, followed on same day by Humble Oil & Refining Co., Vacuum Oil Co., Gulf Pipe Line Co. and Sun Oil Co., but two last named companies' schedules stop at 35 degrees and above at 81 cents, and the Sinclair Refining Co., but latter company's schedule stops at 31 degrees and above at 71 cents.

CALIFORNIA CRUDE OIL PRICES

STANDARD OIL CO. OF CALIFORNIA

For its current purchases of crude oil at the well (unless otherwise specified) the allowable crude oil produced in accordance with allocations made by the California Statewide Curtailment Committee. All gravities above those quoted take highest price offered in that field. Effective June 19, 1931, at 7 a.m.

Gravity	Signal Hill	Seal Beach, Alamitos Heights	Huntington Beach	Inglewood	Olinda-Brea Canon	Torrance	Richfield	Coyote Hills	Santa Fe Springs	Midway-Sunset, Elk Hills, Buena Vista Hills	Lost Hills
14-14.9	$.65	$.65	$.65	$.65	$.65	$.65	$.65	$.65	...	$.55	$.55
15-15.9	.65	.65	.65	.65	.65	.65	.65	.65	...	.55	.55
16-16.9	.65	.65	.65	.65	.65	.65	.65	.65	...	.55	.55
17-17.9	.65	.65	.65	.65	.65	.65	.65	.65	...	.55	.55
18-18.9	.65	.65	.65	.65	.65	.65	.65	.65	...	.55	.55
19-19.9	.65	.65	.65	.65	.65	.65	.65	.65	...	.55	.55
20-20.9	.65	.65	.65	.66	.66	.65	.65	.65	...	.55	.55
21-21.9	.65	.65	.65	.68	.67	.65	.66	.65	...	.55	.57
22-22.9	.65	.65	.66	.70	.68	.66	.68	.65	...	.56	.59
23-23.9	.67	.67	.68	.72	.70	.67	.70	.66	...	.58	.60
24-24.9	.69	.69	.70	.74	.72	.68	.72	.67	$.65	.61	.62
25-25.9	.71	.71	.72	.76	.74	.70	.74	.69	.65	.64	.64
26-26.9	.73	.73	.74	...	.76	...	...	.71	.65	.66	.66
27-27.9	.75	.75	.76	...	.78	...	...	.73	.68	.68	.67
28-28.9	.77	...	...	...	.80	...	...	.75	.71	.71	.69
29-29.9	.79	...	...	...	...	...	...	.77	.73	.74	.71
30-30.9	.81	...	...	...	...	...	...	.79	.75	.76	.72
31-31.9	...	...	...	...	...	...	...	...	.78	...	...
32-32.9	...	...	...	...	...	...	...	...	.80	...	...
33-33.9	...	...	...	...	...	...	...	...	.83	...	...
34-34.9	...	...	...	...	...	...	...	...	.85	...	...
35-35.9	...	...	...	...	...	...	...	...	.87	...	...

Standard Oil Co. of California prices in other fields:
Wheeler Ridge—55 cents per barrel for all grades (14° to 25.9°).
Coalinga—55 cents for all grades from 14° to 24-24.9°; 57 cents for 25 gravity.
Newhall, McKittrick and Kern River—55 cents for all grades (14° to 19.9°).
Montebello—65 cents for all grades (14° to 25.9°).
Whittier and LaHabra—65 cents for all grades (14° to 22.9°).
Elwood Terrace, f.o.b. ship—32° to 33.9°, 79 cents; 34° to 34.9°, 81 cents; 35° to 35.9°, 84 cents; 36° and above, 87 cents.
Playa Del Rey—Prices subject to field gathering charge of 5 cents per barrel—19° to 19.9°, 65 cents; 20° to 20.9°, 65 cents; 21° to 21.9°, 66 cents; 22° to 22.9°, 67 cents; 23° to 23.9°, 68 cents; 24° to 24.9°, 67 cents; 25° and above, 68 cents.

(Continued on Page 134)

TANK WAGON MARKETS

Tank wagon quotations for gasoline and kerosene in United States as furnished by the larger marketing concerns Nov. 10

ALL TANK WAGON AND SERVICE STATION QUOTATIONS INCLUDE TAXES

STANDARD OIL CO. (INDIANA)

	Gasoline			Kero.
	Tank wagon	Service station	Incl'ds tax of	tank wagon
Chicago	15.0	15.0	3.0	9.0
Decatur, Ill.	15.4	15.4	3.0	9.0
E. St. Louis	14.7	14.7	3.0	8.2
Joliet	15.4	15.4	3.0	9.0
Peoria	15.4	15.4	3.0	9.0
Quincy	15.2	15.2	3.0	8.8
Davenport, Ia.	15.5	13.5	3.0	9.3
Des Moines	14.4	14.4	3.0	8.0
Keokuk	15.5	15.5	3.0	6.3
Sioux City	15.1	15.1	3.0	8.9
Duluth, Minn.	16.5	16.5	3.0	9.9
Mankato	16.1	16.1	3.0	8.0
Minneapolis	14.4	14.4	3.0	9.9
La Cross, Wis.	17.2	17.2	4.0	10.9
Milwaukee	16.1	16.1	4.0	8.9
Madison	16.3	16.3	4.0	9.1
Detroit, Mich.	14.5	14.5	3.0	10.7
Grand Rapids	15.7	15.7	3.0	10.8
Saginaw	15.9	15.9	3.0	10.8
Evansville, Ind.	16.1	16.1	4.0	9.9
Indianapolis	16.3	16.3	4.0	10.1
South Bend	16.4	16.4	4.0	8.0
Fargo, N. D.	17.9	17.9	3.0	11.9
Huron, S. D.	17.3	17.3	4.0	10.7
Sioux Falls	16.8	16.8	4.0	10.4
K. C., Mo.	14.9	14.9	3.0	7.6
Springfield*	14.9	14.9	3.0	8.5
St. Louis*	13.4	13.4	2.5	8.3
St. Joseph	12.4	10.4	3.0	7.5
Wichita, Kans.	13.8	13.8	3.0	7.8
Bartlesville, Ok.	14.0	17.0	5.0	7.0

*State tax 2 cents, remainder city tax.

A third grade of gasoline, "Stanolind Blue," is sold at all major points at a price 1½ cents or more below the price on the regular grade.

Effective November 4—New dump discount applicable on all grades of gasoline sold from tank wagon. Any tank wagon customer buying 25 gallons or more at one time will be given 1-cent discount per gallon off tank wagon price at time of delivery. Customers not under contract receive no other discount.

Effective April 15—Discounts on Q.D.A. on 1,000 gallons or more per month throughout territory; Red Crown Ethyl Gasoline, 3 cents off tank wagon price; Red Crown gasoline, 2½ cents off tank wagon price; Stanolind Blue gasoline, 1 cent off tank wagon price. On deliveries of 75,000 gallons or more each classification allowed 1 cent additional discount.

Discounts on resellers authorized agent's agreement: Same amounts as above except made off service station price instead of tank wagon price.

SOUTHWESTERN DISTRICT

Magnolia Petroleum Co.

	Gasoline			Kero.
	Tank wagon	Service station	Incl'ds tax of	tank wagon
Dallas, Tex.	13.0	14.0	4.0	8.0
Fort Worth	13.0	14.0	4.0	7.0
Houston	12.0	14.0	4.0	8.0
San Antonio	12.0	14.0	4.0	7.0
El Paso	14.0	16.0	4.0	10.0
Texarkana	12.0	14.0	4.0	8.0
Muskogee, Ok.	12.0	14.0	5.0	8.0
Okla. City	13.0	15.0	5.0	7.0
Tulsa	13.0	15.0	5.0	8.0
Ft. Smith, Ark.	*15.5	16.5	5.0	*11.0
Little Rock	*16.5	17.5	6.0	*11.0

One-cent rebate made from posted station prices to cash purchasers in Louisiana, Arkansas and Tennessee.

*Less 2 cents to dealers.

ROCKY MOUNTAIN DISTRICT

Continental Oil Co.

	Gasoline			Kero.
	Tank wagon	Service station	Incl'ds tax of	tank wagon
Denver, Colo.	14.0	17.0	4.0	12.5
Pueblo	12.0	15.0	4.0	12.0
Grand Jctn.	18.0	21.0	4.0	14.5
Casper, Wyo.	15.0	18.0	4.0	10.0
Cheyenne	†15.0	15.0	4.0	11.5
Butte, Mont.	18.0	21.0	5.0	16.0
Billings	20.0	23.0	5.0	14.5
Great Falls	21.0	23.0	5.0	16.0
Helena	21.0	23.0	5.0	16.0
Salt Lake, Utah	17.5	20.5	4.0	16.0
Albu'que, N. M.	18.0	21.0	6.0	14.0
Boise, Idaho	20.5	23.5	5.0	18.0
Twin Falls*	20.5	21.0	5.0	18.0

*2½-cent discount off tank wagon to dealers.

†3-cent discount off tank wagon to dealers.

OHIO

Standard Oil Co. (Ohio)

	Gasoline			Kero.
	Tank wagon	Service station	Incl'ds tax of	tank wagon
Ohio points	15.0	16.0	4.0	*12.0

Dealers and commercial accounts 2 cents under tank wagon.

*Service station price 13 cents.

NEBRASKA

Standard Oil Co. (Nebraska)

	Gasoline			Kero.
	Tank wagon	Service station	Incl'ds tax of	tank wagon
Omaha	14.9	15.9	4.0	9.25
McCook	17.0	17.0	4.0	7.5
Norfolk	16.75	17.75	4.0	9.75
N. Platte	17.75	18.75	4.0	10.50
Scottsbluff	17.0	17.0	4.0	9.0

Note—Dealers' discount allowed as follows: Red Crown Ethyl, 3 cents off station price; Red Crown, 2½ cents off normal service station price; Nebraska Blue (third grade), 1 cent off normal service station price.

PACIFIC COAST TERRITORY

	Gasoline			Kero.
	Wh'l'e price	Retail* price	Incl'ds tax of	tank wagon
Fresno	19.5	16.5	3.0	17.0
San Francisco	19.5	16.5	3.0	15.5
Los Angeles	19.0	16.0	3.0	15.5
Reno, Nev.	22.5	20.5	4.0	19.0
Portland, Ore.	21.0	18.0	4.0	16.5
Seattle, Wash.	22.0	19.0	5.0	16.5
Tacoma	22.0	19.0	5.0	16.5
Spokane	25.5	22.5	5.0	20.5
Phoenix, Ariz.	15.5	16.0	5.0	20.0

Above prices are at company's plant or depots as company does not operate stations. A 6-cent per gallon discount is given dealers and customers taking tank wagon lots except in Phoenix where the discount is 3 cents plus a 2-cent special temporary discount subject to withdrawal at any time.

*Retail prices posted by Standard Stations, Inc., a subsidiary.

PENNSYLVANIA-DELAWARE AND PART OF NEW ENGLAND

Atlantic Refining Co.

	Gasoline			Kero.
	Tank wagon	Service station	Incl'ds tax of	tank wagon
Pittsburgh, Pa.	*11.0	*12.0	...	11.0
Philadelphia	*10.0	*11.0	...	11.0
Scranton	*10.0	*11.0	...	11.0
Allentown	*10.0	*11.0	...	11.0
Altoona	*11.0	*12.0	...	11.0
Erie	*11.0	*12.0	...	11.0
Dover, Del.	14.0	15.0	3.0	11.0
Wilmington	14.0	15.0	3.0	11.0
Springfd, Mass.	13.0	14.0	3.0	10.0
Worcester	14.3	15.3	3.0	10.0
Boston	13.5	14.5	3.0	10.0
Providence, R.I.	11.3	13.1	2.0	10.0
Hartford, Conn.	13.0	14.0	3.0	10.0
New Haven	14.6	15.6	2.0	10.0

*Does not include tax of 3 cents in Pennsylvania. Pennsylvania tax is collected by the dealer and paid by him direct to the State. The above prices are subject to discounts to the dealers and to commercial accounts under contract for one year in accordance with Code of Ethics.

CENTRAL SOUTH DISTRICT

Standard Oil Co. (Louisiana)

	Gasoline			Kero.
	Tank wagon	Service station	Incl'ds tax of	tank wagon
N. Orleans, La.	14.5	14.5	6.0	12.0
Baton Rouge	16.5	17.0	5.0	12.0
Alexandria†	17.0	17.0	6.0	12.0
Lafayette*	17.5	18.0	6.0	12.0
Lake Charles*	16.5	15.5	6.0	12.0
Shreveport	16.5	17.0	5.0	12.0
Knoxville, Tenn.	20.0	20.5	6.0	13.5
Memphis	17.0	17.0	6.0	10.0
Chattanooga	19.5	20.0	6.0	12.0
Nashville	19.0	19.5	6.0	12.5
Bristol	19.5	20.0	6.0	14.0
Lt. Rock, Ark.	17.5	18.0	6.0	11.0

*Includes city tax of 1 cent. Louisiana kerosene prices include 1-cent state tax. New Orleans kerosene price also includes 1-cent city tax.

†Gasoline price at Alexandria includes 1-cent tax in parish of Rapides.

Two-cent discount off gasoline and kerosene tank wagon price to dealer and commercial accounts.

NEW YORK AND PART OF NEW ENGLAND DISTRICT

Standard Oil Co. (New York)

	Gasoline			Kero.
	Tank wagon	Service station	Incl'ds tax of	tank wagon
Albany, N. Y.	16.6	17.6	2.0	15.6
New York*	15.3	15.3	2.0	14.3
Buffalo	15.8	15.8	2.0	14.8
Rochester	16.0	16.0	2.0	14.0
Syracuse	16.8	16.8	2.0	14.8
Boston, Mass.	16.5	16.5	3.0	13.5
Augusta, Me.	18.8	18.8	4.0	14.8
Manch'tr, N. H.	18.4	18.4	4.0	14.0
Burlington, Vt.	19.3	19.3	4.0	15.3

*Prices in steel barrels.

ATLANTIC COAST DISTRICT

Standard Oil Co. (New Jersey)

	Gasoline			Kero.
	Tank wagon	Service station	Incl'ds tax of	tank wagon
Atl'tic City, N.J.	14.7	15.7	3.0	11.5
Newark	13.7	14.7	3.0	10.5
Annapolis, Md.	15.2	16.2	4.0	11.0
Baltimore	14.4	15.4	4.0	8.5
Cumberland	16.2	17.2	4.0	12.0
Wash'ton, D. C.	12.9	13.9	2.0	10.7
Danville, Va.	17.0	18.0	5.0	11.8
Norfolk	15.5	16.5	5.0	10.3
Petersburg	16.5	17.5	5.0	11.3
Richmond	15.9	14.9	5.0	10.7
Roanoke	17.2	18.2	5.0	12.0
Charles'n, W.Va.	15.7	16.7	4.0	11.5
Keyser	16.3	17.3	4.0	12.1
Parkersburg	14.4	15.4	4.0	10.2
Wheeling	15.6	16.6	4.0	11.4
Charlotte, N. C.	18.5	19.5	6.0	10.7
Hickory	18.8	19.8	6.0	12.6
Mount Airy	18.7	19.7	6.0	12.5
Raleigh	18.4	19.4	6.0	12.2
Salisbury	18.7	19.7	6.0	12.5
Charleston, S.C.	16.5	17.5	6.0	10.2
Columbia	18.4	19.4	6.0	12.2
Spartanburg	18.7	19.7	6.0	12.5

Two cents per gallon discount off retail tank wagon price of gasoline to dealers except Washington, D. C., and State of Maryland and New Jersey, where discount is 3 cents.

SOUTHERN DISTRICT

Standard Oil Co. (Kentucky)

	Gasoline			Kero.
	Tank wagon	Service station	Incl'ds tax of	tank wagon
Atlanta, Ga.	17.5	17.5	6.0	12.5
Augusta	19.0	20.0	6.0	14.0
Macon	19.0	19.0	6.0	12.0
Savannah	17.0	17.0	6.0	12.0
Birm'ham, Ala.	15.5	15.5	6.0	13.0
Mobile	17.5	17.5	5.0	10.0
Montgomery	20.0	20.0	6.0	13.5
Jackson	16.0	16.0	5.5	11.5
Jack'ville, Fla.	19.0	19.0	7.0	12.0
Miami	19.0	20.0	7.0	13.0
Pensacola	20.0	21.0	7.0	13.0
Tampa	19.0	19.0	7.0	12.0
Lexington, Ky.	17.0	18.0	5.0	12.0
Covington	17.0	18.0	5.0	11.0
Louisville	15.0	16.0	5.0	10.0
Corbin	18.0	19.0	5.0	15.0

A third grade "Kyso Green," is sold at a price generally 2 cents below the price on the regular grade.

In addition to the state tax of 4 cents on gasoline, Montgomery has city and county tax of 2 cents on gasoline and one-half cent on kerosene. Kerosene prices in Georgia include 1-cent tax. In Florida, an inspection fee of 0.125 cent; in Alabama, an inspection fee of one-half cent on kerosene and one-fourth cent on gasoline. To Pensacola, Montgomery and Birmingham state taxes add 1-cent levy tax. To Gulfport state tax add privilege tax of 2 cents. To Mobile state tax add 1-cent city tax and 2½ cents county tax.

Effective April 2 price to dealers 2 cents under posted tank wagon price.

NAPHTHA

	Tank wagon	Tank car
Oleum spirits	11.7	6.0
V.M.P. naphtha	13.7	7.5
Cleaners' naphtha	15.2	9.0
Stanisol	15.2	9.0

Tank wagon prices f.o.b. Chicago and Whiting, effective Nov. 6.

STANOLIND FURNACE OIL IN CHICAGO

Effective July 1, prices f.o.b. Chicago, tank wagon prices: 1 to 99 gallons, 8 cents; 100 gallons or more, 6 cents.

Stanolex Fuel

Effective May 9, f.o.b. Chicago, tank wagon prices: 1 to 199 gallons, 7 cents; 200 gallons or more, 5 cents. Sinclair met this by bringing down the price of its No. 3.

Fuel Oils

Chicago tank wagon prices (in lots of 400 gallons and over): 38-40 straw distillate, 6 cents; 32-36 gas oil (light zero), 5.5 cents; 32-36 gas oil (industrial), 5.25 cents; 28-30 zero fuel oil, 5 cents; 24-26 fuel oil, 4.25 cents; 18-22 fuel oil, 3.75 cents.

TANK WAGON CHANGES

Standard Oil Co. of Louisiana reduced the gasoline tank wagon and service station prices in Lake Charles, La., to 14.5 cents October 30. On November 5 the gasoline tank wagon and service station prices were advanced throughout Tennes-

(Continued on Page 127)

CRUDE OIL PRICE CHANGES

Effective November 9 the Stoll Oil Refining Co. increased the price of Hart County, Kentucky, crude oil 15 cents per

(Continued on Page 136)

CRUDE OIL PRICES

(Continued from Page 125)

and Magnolia Petroleum Co.; Stephens, Ark., by Louisiana Oil Refining Co. and Atlantic Oil Producing Co.

SOUTH CENTRAL AND SOUTHWEST TEXAS

Darst Creek (Nov. 2, 1931)‡	$ .40
Luling (Nov. 2, 1931)†	.40
Mirando (Nov. 2, 1931)†	.75
Pettus (Nov. 2, 1931)*	.85
Salt Flat (Nov. 2, 1931)*	.40
Thrall§	
Lytton Springs (Lockhart). See gravity table	
Dobrowolski§	
Same as Mid-Continent gravity scale up to and including 38-38.9°.	
Somerset§	
Same as Mid-Continent gravity scale up to and including 38-38.9°.	

‡The Texas Company. *Humble Oil & Refining Co. †Magnolia Petroleum Co. §Thrall prices same as North Central Texas less 19½ cents per cwt. freight. ¶Grayburg Oil & Refining Co., Pioneer Oil & Refining Co. and Texas Petroleum Products. ‖Pioneer Oil & Refining Co.

ROCKY MOUNTAIN STATES
Ohio Oil Co.-Midwest Refining Co.

Iles, light (Aug. 24, 1931)	$ .75
Iles, heavy (Aug. 24, 1931)	.53
Fort Collins (Nov. 3, 1931)	.71
Florence (Nov. 2, 1931)	.65
Wellington (Nov. 3, 1931)	.61
Dutton Creek (Nov. 3, 1931)	.75
Rock Creek, Wyo. (Nov. 3, 1931)	.85
Frannie, light (Nov. 3, 1931)	.61
Frannie, heavy (Nov. 3, 1931)	.51
Salt Creek. Mid-Continent gravity table	
Big Muddy (Nov. 3, 1931)	.83
Grass Creek (Nov. 3, 1931)	1.05
Elk Basin (Nov. 3, 1931)	1.05
Lance Creek (Aug. 24, 1931)	1.05
Poison Spider (Mar. 5, 1931)	.70
Notches (Mar. 14, 1927)	.65
Hudson (June 2, 1931)	.65
Lander (Mar. 5, 1931)	.40
Rex Lake (Feb. 22, 1930)	1.10
Osage (Apr. 15, 1931)	.98
Lost Soldier (Nov. 3, 1931)	.69
Hamilton Dome (Nov. 2, 1931)	.45
Greybull (Nov. 3, 1931)	1.05
Cat Creek (Nov. 3, 1931)	1.05
Pondera (Nov. 3, 1931)	.90
Sunburst, Mont. (Nov. 3, 1931)	1.00
Hogback, N. Mex. (Aug. 24, 1931)	.90
Lea County, N. Mex. (Nov. 3, 1931)	.50
Border, Mont.	1.55
Red Coulee, Alberta	1.55
Dry Creek, Mont. (Aug. 24, 1931)	1.00
Maljamar (Aug. 22, 1931)	1.00
Artesia-Jackson (Nov. 3, 1931)	.50

Note—Salt Creek, Cat Creek, Dry Creek, Dallas-Derby, Hudson, Greybull and Hogback posted by Midwest Refining Co. and remainder by Ohio Oil Co. Both companies posted Grass Creek light and Elk Basin. Lost Soldier posted by Producers and Refiners Corp. Artesia, Jackson and Maljamar posted by Continental Oil Co. Border and Red Coulee posted by Imperial Refining Co. Lea County posted by Humble Oil & Refining Co. Fort Collins, Wellington, Orchard, Florence, Rattlesnake and Table Mesa by the Continental Oil Co. Osage posted by Arro Oil & Refining Co.

MIDDLE WESTERN STATES
Ohio Oil Co.
(Effective November 3, 1931)

Lima	$1.00
Wooster	1.15
Illinois	.95
Indiana	.60
Princeton	.95
Plymouth	Shut in
Western Kentucky	.90
Midland, Mich. (Oct. 9, 1931)*	.55
Dundee, Mich.†	
Same as Stanolind Crude Oil Purchasing Co.'s Mid-Continent gravity scale	
Upper and Lower Traverse Sands, Mich.†	
Same as Mid-Continent gravity scale	
Somerset, Ky. (Nov. 4, 1931)	.60
Hart County, Ky. (Nov. 1, 1931)‖	.60

*Posted by Pure Oil Co. †Posted by Standard of Indiana for boat shipment. ‖Posted by Stoll Refining Co. Somerset, Ky., crude purchased by Ashland Refining, Ashland, Ky., and delivered through its own pipe line.

MEXICO

Panuco*	$ .45

*F.o.b. ship, based on October transactions and exclusive of production and export taxes and bar dues.

CANADA

Ontario (Nov. 3, 1931):	
Petrolia*	$1.90
Oil Springs*	1.97
Alberta (Aug. 24, 1931):	
Turner Valley:†	
Crude oil 45-45.9	2.60
Crude oil 50 and above	2.45
Crude naphtha	3.12
Discolored naphtha	2.83

*Imperial Oil, Ltd. †Imperial Oil, Ltd. and Regal Oil & Refining Co.

ROCKY MOUNTAIN MARKETING IMPROVES

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a reasonable period of time. The code committee promoted an educational campaign, with the result that in a comparatively short time all of the marketers in the State seemed very glad to fall into line and abandon this expensive and vicious practice.

Other States Follow

From Montana the movement spread to the other Rocky Mountain states. The various state code committees adopted resolutions to the same general effect, although each one differs from the others in some minor particulars because of the divergent views among the members of the committees in the different states. At the present time I think I am justified in saying that the practice of loaning gasoline dispensing equipment has been, for all practical purposes, discontinued in all of the Rocky Mountain states, with the possible exception of New Mexico. There a difference of opinion as to whether the new rule should apply to "lease and agency agreements," as well as to uncontrolled accounts, has delayed the consummation of the plan.

From our experience with this problem in the Rocky Mountain states, I am convinced that the matter can be most effectively handled through the various state subcommittees rather than by any immediate attempt at national action. Conditions differ materially in different states; and just as the practice itself evolved over a period of years at varying rates in different localities, so its elimination will take some time and progress more rapidly in some states than in others. I, personally, cannot conceive, however, of any activity in which the various state subcommittees can legitimately engage resulting in more immediate practical benefit to the industry. From the standpoint of jobber and manufacturer, an immediate and very large saving in distribution costs can be obtained; and from the standpoint of the retailers and resellers generally, they certainly cannot be benefited by the continuance of a practice which encourages the entry of others into their already overcrowded field.

In as much as it was deemed wholly impractical to disturb existing loaned equipment, the objection was immediately raised that the discontinuance of the practice would tend to freeze the competitive situation in favor of those who already had the lion's share of the business. This objection was quickly dissipated by a little analysis. To the extent that any marketer had a valid contract for the sale of petroleum products, the code prohibited inducing a breach of that contract; and, if there was no such contract, it has been generally understood, and followed out in practice, that a competitor obtaining an account is entitled to purchase at its depreciated value any existing loaned equipment then in use. Aside from the theoretical complaint upon this score, raised at the outset of the discussion in each of the states, I am not aware of any serious difficulty in this respect since the program has gone into effect.

Some of the marketers have been willing to eliminate the loaning of gasoline dispensing equipment, but have reserved the right to continue to loan lubricating oil and grease dispensing equipment. There is some difference of interest in this respect between companies engaged primarily in the distribution of lubricating oils and those selling both gasoline and lubricating oil. In principle, however, the loaning of any type of equipment seems to me to be an unnecessary expense assumed by the manufacturer or jobber, so long as none of his competitors is indulging in that practice; and it is one that undoubtedly tends to a ruinous multiplication of outlets. Perhaps, to some, such multiplication of outlets in the distribution of lubricating oils may at present not seem undesirable and to offer some control over substitution and adulteration. The ultimate effect is certain to be no different. The total lubricating oil business will not be increased. The volume of each outlet will be diminished, and the cost of distribution proportionately increased.

Discontinue Loaning

There was originally also some difference of opinion as to whether the loaning of equipment should be discontinued not only to uncontrolled accounts, but also under "lease and agency agreements." The argument was made that, when a service station or pump location was leased, it immediately fell for all practical purposes into the same class as an owned outlet, and there could be no objection to spending money to improve one's own property. This is undoubtedly true when the lease is a real estate transaction entirely independent of the "agency agreement." Where, however, the "lease and agency agreements" are executed simultaneously, and the lessor is designated as the agent of the lessee to continue to operate the property, it has been concluded that, in the Rocky Mountain territory at least, there should be no distinction between loans of equipment, or the free installation of such equipment, under a "lease and agency agreement" and the ordinary uncontrolled account. In fact, it seemed absurd to decline to loan equipment to an uncontrolled account on a 3-cent retail margin, and to loan equipment to another re-seller who is receiving not only the 3 cents as his agent's commission, but in addition thereto a rental of some kind for his property. It is true there is not the same hazard of having to take the equipment out in a short time as in the case of the uncontrolled account, but no good reason has presented itself why any rental should be paid in the first instance for anything except a completely equipped station. Furthermore, the reservation of the right to continue to loan equipment under "lease and agency agreements" or controlled accounts created a very definite impression in the minds of the smaller jobbers that the major companies were seeking an advantage.

While it is difficult to devise any definition which will clearly distinguish between the "lease and agency" arrangement—which is primarily a real estate transaction—and one which is primarily a marketing contract; since, as a practical proposition, there is not one instance in a thousand where, after all the circumstances are disclosed and fairly considered, the matter is even debatable. We appreciate that in other sections of the United States, to a much greater extent than in the Rocky Mountain region, there are "lease" and "agency" arrangements where the lease is, in reality, a real estate transaction and the agency agreement is a marketing matter; but, without attempting to offer any satisfactory definition of the difference, the discussion in any particular case usually involves the shadow of the transaction rather than the substance.

INSTITUTE FINDS CONDITIONS BETTER

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October 1, 1930. Also that imports of crude oil will show a very material decrease.

Research on Corrosion

Considerable progress is being made in the research work devoted to corrosion in the petroleum industry, according to reports made and papers presented at the meeting here. Dr. Gordon N. Scott, the Institute's research associate at the United States Bureau of Standards, made an especially comprehensive report, covering the installation of test coatings under the plan authorized by the Institute in which coating manufacturers co-operate. He also reported on the initial inspection of specimens being tested under the plan.

Doctor Scott, in summarizing his report, included the following conclusions: That enamel coatings without shields or reinforcements reduce the anticipated average pitting by roughly 50 per cent or less; that all fabric reinforced treatments, excepting one reinforced grease coating tested, reduce the anticipated average pitting by 80 per cent or more; that shields are effective in general, but wood veneer is less effective than strip steel or pipe line felts, and that the problem of perfect protection is still largely one of minimizing the effect of soil stress.

Pipe Line Valves

Few men in the petroleum industry realize the many vexing problems constantly confronting the different branches of the business and the departments of the various divisions, all of which, in some form or other, are being presented to committees meeting here this week as part of the Institute's convention. For instance, pipe line men are interested in the meeting today scheduled to consider the request of railroad companies that pipe line companies install gate valves on all lines where these lines cross railroad rights of way. As one pipe line company official stated: "If we would put in such gate valves and did not lock them, someone probably would come along and close the valve, resulting in blowing up the line as the pressure increased. If the valves were locked, what use would they be in case of a railroad wreck at that point, for who, under those conditions, would have a key to open the lock and close the valve?"

Few men outside the industry realize transporting oil by pipe line is different from piping water in a city, their conception of pipe line transportation being that a valve can be closed and the flow of oil stopped, without damage to the line, just as one closes a water faucet in his home. They fail to realize pumps in the pumping station would soon build up a pressure against a closed valve which would wreck the line.

Work of Committees

Each of the committees meeting here this week is considering its own peculiar problems and matters affecting the welfare of different branches of the business. The subjects under discussion cover a wide range and include such matters as transportation regulations, tank strapping and gauging standards, fire prevention in refineries, disposal of refinery wastes, uniform methods of oil accounting, freight classification, the code of ethics, uniform state gasoline tax laws, railroad transpotration, testing methods and specifications, public relations, fire prevention in marketing, standardization of refinery equipment, drilling and production practices, automotive transportation in marketing, matters relating to the measuring, sampling and testing of crude oil; pipe line crossings under railroads, and railroad equipment. All these subjects have been taken up by the different committees working on them and are in addition to the prepared papers and addresses delivered at the open meetings being held daily.

No Czar for Industry

The 4-year-old subject of a czar for the petroleum industry is being mentioned occasionally at this convention as at the three preceding, but no action will be taken. The feeling is growing among oil men that the chances are very remote of the petroleum industry ever adopting such a procedure for the country as a whole. It is felt the plan of a state or district arbiter is feasible and constructive, but that existing conditions and the antitrust laws would so tie the hands of a national arbiter as to render the position useless.

Cicero I. Murray, chairman of the oil states' advisory committee, is at the convention, having called his committee to meet here today to formulate plans for asking congress to take the necessary steps to permit the carrying out of the plan of an interstate compact. Colonel Murray feels the interstate compact idea, if made effective, would result in uniform conservation laws and stabilization of production for all oil producing areas.

The advisory committee of the public relations department of the Institute adopted a resolution for consideration by the board of directors recommending that the Institute urge each company not now so equipped to employ a competent public relations man and provide him with the means to make his efforts effective.

Exposition Dates Uncertain

Discussions among oil men and equipment manufacturers attending the institute indicate that the International Petroleum Exposition will not be held next spring as originally planned, but that it probably will be held next fall if business conditions continue to improve. The question will be decided at a meeting to be held in Tulsa within the near future.

TANK WAGON CHANGES

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see, southern Louisiana and in Alexandria, La. In northern Louisiana and Arkansas these prices were advanced one-half cent. On November 7 the gasoline tank wagon and service station prices were reduced in New Orleans to 14.5 cents.

Standard Oil Co. of Kentucky reduced the gasoline tank wagon and service station prices to 17½ cents in Atlanta, Ga., October 27. On November 1 the gasoline tank wagon and service station prices were advanced 1 cent to 20 cents in Montgomery, Ala., to equalize the 1-cent county tax which became effective on that date. On the same date the Mississippi state tax was advanced one-half cent to 5½ cents and a corresponding advance was posted in the gasoline tank wagon and service station prices in Jackson and Vicksburg, which on that date were posted at 16 cents each in Jackson and 15 cents each in Vicksburg.

Continental Oil Co. advanced the gasoline tank wagon and service station prices throughout Wyoming, Montana, Colorado and New Mexico November 7, with Denver and Pueblo excepted.

Standard Oil Co. of Indiana advanced the gasoline tank wagon and service station prices 1 cent November 6 throughout its marketing territory. On the same date the tank wagon price on each grade of special naphthas was increased 1 cent.

Standard Oil Co. of Nebraska advanced the gasoline tank wagon and service station prices 1 cent November 7 throughout Nebraska.

Standard Oil Co. of New Jersey reduced the gasoline service station price to 14.9 cents in Richmond, Va.

Atlantic Refining Co. advanced the gasoline service station price in Philadelphia to 11 cents November 9.

Magnolia Petroleum Co. advanced the gasoline tankwagon and station prices 1 cent throughout Oklahoma November 4. On November 5 an advance of one-half cent was posted in these prices throughout Arkansas and Louisiana, and on November 7 an advance of 1 cent was posted in these prices throughout Texas.

Standard Oil Co. of Ohio advanced the gasoline tankwagon and station prices 1 cent November 7 in Ohio.

Continental Oil Co. increased the dealer allowance to 3½ cents per gallon in Twin Falls, Idaho, on November 6. This discount is taken off the tankwagon price at time of delivery.

Standard Oil Co. (Kentucky) advanced gasoline tankwagon and station prices in Jacksonville and Tampa, Fla., to 19 cents each October 28. On the same date these prices were advanced to 19 cents and 20 cents in Miami, Fla. On November 1 the gasoline tankwagon and station prices were posted as follows in the respective marketing centers: Covington, Ky., 17 cents and 18 cents; Lexington, Ky., 16 cents and 17 cents; Jacksonville, Fla., 19 cents each; Miami, Fla., 19 cents and 20 cents, and in Tampa, Fla., 19 cents each.

W. H. MYERS DIES

OIL CITY, Pa., Nov. 9.—William Henderson Myers, 84, widely known as an oil well driller through the petroleum fields of Pennsylvania, West Virginia and Oklahoma, died at the home of his son, Titusville, after an illness of a week. Nineteen years ago he moved to Oklahoma, returning to this city two years ago.

DEATH OF T. A. NEILL

OIL CITY, Pa., Nov. 7.—Thomas Alexander Neill, 73, for many years general superintendent of the West Virginia district for the South Penn Oil Co., died in the Oil City hospital Tuesday after an extended illness.

PURE HYDROCARBON IMPROVES OIL FLOW

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of Paraflow does not result in any detrimental features of operation. Carbon accumulations are essentially the same in three of the four tests. If any choice exists on oil consumption, it is in favor of the treated oil. Crankcase condition, wear, piston ring condition, valve stem lubrication and general engine condition are, if anything, better for Paraflow oils.

(c) Low-temperature performance.—In discussing the significance of pourpoint, it was pointed out that the ease of starting a motor was independent of the actual pourpoint but dependent upon the extrapolated viscosity at the operating

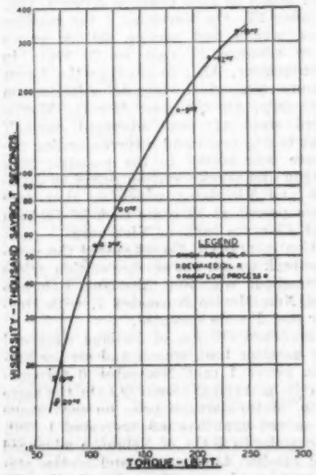

Figure 5—Low temperature cranking. Mack BG—data at 30 r.p.m.

temperature. Since the use of Paraflow introduces a new factor into the operation of motor oils at low temperatures, tests were made on the ease of starting of oils with and without Paraflow. These tests consisted of measuring with an electric dynamometer the torque required to crank the engine with these oils at various temperatures. The results of these tests (see Figure 5) show that the ease of starting of motor oils with and without Paraflow and dewaxed all are a function of the extrapolated viscosity, as shown by Blackwood and Rickles[1] and by Larson[2] for normal motor oils.

Data were taken simultaneously as to the time required for the oil to establish circulation in the delivery line from the pump, as indicated by a try cock in the line. These data are shown in Table 17 and show definitely that Paraflow facilitates pumpability. If these data are plotted, and comparison of the three oils made at the same temperature, it can be shown that down to about 5° below their pourpoints, the time required to establish oil flow is in the order of their viscosities at the respective temperatures, but that at still lower temperatures the pumpability becomes a function of the pour. The 25° F. pourpoint oil shows no circulation below 10° to 15° F., and the zero pourpoint Paraflow requires one-third less time to establish flow at —10° F. than the dewaxed oil.

Hence it is seen that by using Paraflow it is possible to retain all the advantages of the flat viscosity temperature gradient of the waxy oils and at the same time obtain the desirable characteristics of low pour oils for pumpability.

TABLE 17—EFFECT OF PARAFLOW ON OIL PUMPING

Oil—	Pour point °F.	Time in min. for oil to flow from try cock in oil delivery line Test A	Test B	Test C
62 viscosity at 210° F. Penna. motor oil	25	No flow at —9° F.	No flow at + 3° F.	3.0 min. at 20° F.
Same after dewaxing	5	13.0 min. at —12° F.	4.3 min. at + 2° F.	4.7 min. at 19° F.
Same + one-half per cent Paraflow	0	5.2 min. at —15° F.	4.2 min. at 0° F.	4.3 min. at 20° F.

3. Lubricating characteristics.—Paraflow blended oils were examined on several special laboratory machines for determination of those lubricating qualities which cannot be specifically isolated on an engine test. These tests included work on the General Motors pin and bushing machine (load carrying capacity); Timken Bearing Co. lubricant tester (load capacity); special high bearing pressure "oiliness" machine; and a Stephens consistometer. Typical data obtained on these individual machines are shown below:

(a) General Motors pin and bushing tests.—Table 18 shows the maximum load carried before failure.

TABLE 18—GENERAL MOTORS PIN AND BUSHING MACHINE DATA

Oil used—	Test speed r.p.m.	Load carried with Paraflow lbs./sq. in.	Per cent used	Load carried without Paraflow lbs./sq. in.
Penn. medium motor oil	100	7,000	1½	5,000
Penn. medium motor oil No. 2	100	6,000	1½	4,000
Gear oil	100	25,000	1	22,000
Penn. aviation oil	25	20,000	2	18,000

In all cases Paraflow slightly improves the load carrying capacity of the lubricants tested.

(b) Timken bearing testing machine—The same oils were run on this machine as were run on the General Motors pin machine. The data show no difference between the straight oils and Paraflow treated oils.

(c) Special oiliness machine.—As previously explained, viscosity has very little influence on torque readings obtained at low speed on this machine. While this instrument may not be measuring true oiliness, at least the data are an indication that oils of low torque have some advantageous quality not enjoyed by oils showing higher torques. Tabulated data are shown in Table 19 and show that so far as such measurements can determine the facts, Paraflow tends to improve the inherent lubricating value of a motor oil.

(d) Stephens consistometer.—Tests were also run on this instrument because its use in the oil industry has become quite widespread. The results are shown in Table 20. These data are markedly in favor of Paraflow.

TABLE 19—COMPARISON OF "OILINESS" OF LUBRICANTS WITH AND WITHOUT PARAFLOW

	Torques (pound-inches)*			
R.p.m.	Penn. medium	Penn. medium + 1½ % Paraflow	Penn. medium No. 2	Penn. medium No. 2 + 1½ % Paraflow
100	3.74	3.61	3.97	3.75
200	3.37	3.29	3.51	3.39
300	3.17	3.14	3.29	3.21
400	3.08	3.06	3.17	3.11
500	3.03	3.03	3.10	3.07
600	3.01	3.01	3.06	3.02
700	3.00	3.00	3.03	2.97

*Sensitivity ±0.05 pound inches torque.

TABLE 20—STEPHENS CONSISTOMETER DATA

		Torques at various temperatures 40° F.	30° F.	10° F.	0° F.
(a)	Transmission test—				
	62 vis. 35° F. pourpoint Penn. motor oil	320	500	1,250	1,900
	Same + 1¼ per cent Paraflow	300	300	650	1,350
(b)	Fluidity test—				
	62 vis. 35° F. pourpoint Penn. motor oil	...	15	60	110
	Same + 1¼ per cent Paraflow	...	0	40	70

Summary

1. A study of dewaxing paraffin base oils has indicated that in order to obtain the advantages of low pour oils (pumpability and quick distribution at low temperature) by this method it is necessary to degrade the oil to some extent in most of its other characteristics, viz:

(a) Decrease the viscosity index of the oil with resultant increase in difficulty of starting.

(b) Increase the carbon forming tendency of the oil by removal of the wax.

(c) Increase the volatility of the oil, which causes increased oil consumption in the engine.

(d) Decrease the lubricating characteristics of the oil as indicated by lessened load carrying ability and "oiliness."

(e) Decrease oxidation stability with consequent sludging in the engine and other deleterious effects.

2. It has been found that by the use of small quantities of Paraflow, a pure hydrocarbon lubricant, it is possible to reduce the pourpoint of paraffin base oils, and obtain the advantage of low pour oils, without impairing the other desirable characteristics of the oils.

3. Exhaustive tests show that the low pour oil thus produced is entirely stable, has no unexpected or unusual effect upon the engine, and is somewhat superior to the original oil with regards to lubricating characteristics.

4. It has been found possible by the use of Paraflow to produce oils of lower pourpoint than can be economically obtained by dewaxing.

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[7]Ries, E. D.—Ind. and Eng. Chem., Anal. Ed. I, No. 4, 187 (1929).

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EAST TEXAS FIELDS

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feet. Same corporation's No. 3 Tuttle, location abandoned.

Arkansas Fuel Oil Co.'s No. 8-A Lathrop, top sand 3,598 feet, initial production 80 bbls. in 30 minutes through open tubing, total depth 3,611 feet. Same company's No. 9-A Lathrop, top sand 3,566 feet, initial production 65 bbls. in 30 minutes through open tubing, Same company's No. 1-C McKinley, top sand 3,597 feet, initial production 84 bbls. in 30 minutes through open tubing, total depth 3,620 feet. Atlantic Oil & Production Co.'s No. 1 Moore, top sand 186 bbls. in 1½ hour through tubing choke, total depth 3,556 feet. Badgett & Cooper's No. 2 Clements, top sand 3,619 feet, initial production 65 bbls. per hour through various chokes, total depth 3,639 feet.

Champlin & Bass's No. 1 Mattox, top sand 3,617 feet, initial production 500 bbls. in 6½ hours through tubing, total depth 3,640 feet. Cox & Hammon's No. 1 Lacy, top sand 3,486 feet, initial production 120 bbls. per hour through tubing, total depth 3,545 feet. Cranfill & Reynolds' No. 2 R. C. Burnswell, top sand 3,441 feet, initial production 272 bbls. per hour through tubing, total depth 3,490 feet. Cranfill & Reynolds' No. 4 Porter, top sand 3,648 feet, initial production 168 bbls. per hour through three-fourths-inch tubing choke, total depth 3,660 feet. Tom David and others' No. 1 W. S. Pryor, abandoned, total depth 65 feet. Dinham Oil Co.'s No. 2 McGrede, top sand 3,650 feet, initial production 100 bbls. per hour through various chokes, total depth 3,677 feet. Paul Doran's No. 1 Bingham, top sand 3,661 feet, initial production 150 bbls. per hour through one-half-inch tubing choke, total depth 3,597 feet.

Empire Gas & Fuel Oil Co.'s No. 3 Bender, top sand 3,563 feet, initial production 95 bbls. in 15 minutes through open tubing, total depth 3,631 feet. Same company's No. 3 L. A. Jeter, top sand 3,554 feet, initial production 150 bbls. in 30 minutes through tubing, total depth 3,599 feet. F. H. E. Oil Co.'s No. 3 B. C. Christian, top sand initial production 140 bbls. per hour through various chokes, total depth 3,651 feet. G. & A. Oil Co.'s No. 2 R. R. Collins, top sand 3,636 feet, initial production 116 bbls. per hour through three-fourths-inch tubing choke, total depth 3,656 feet. Gregg Oil Co.'s No. 2 T.P.R.R., top sand 3,468 feet, initial production 200 bbls. per hour through 1-inch tubing choke, total depth 3,540 feet.

Gresham & Hunter's No. 1-C T.&P. R.R., top sand 3,565 feet, initial production 150 bbls. per hour through three-fourths-inch tubing choke, total depth 3,628 feet. Gulf Production Co.'s No. 4 Sheppard, top sand 3,488 feet, initial production 111 bbls. per hour through three-fourths-inch tubing choke, total depth 3,511 feet. Same company's No. 5 Sheppard, top sand 3,477 feet, initial production 120 bbls. per hour through three-fourths-inch tubing choke, total depth 3,511 feet. Hamkamer & Lee's No. 1 C. Jones, top sand 3,638 feet, initial production 70 bbls. per hour through one-half-inch tubing choke, total depth 3,660 feet. Harper Petroleum Co.'s No. 1 W. Jones, location abandoned. Humble Oil & Refining Co.'s No. 3 T. B. Harris, top sand 3,509 feet, initial production 75 bbls. per hour through three-fourths-inch tubing choke, total depth 3,545 feet.

Invincible Oil Co.'s No. 1 Chaney Jones, top sand 3,650 feet, initial production 150 bbls. per hour through 1-inch tubing choke, total depth 3,680 feet. Lucy Petroleum Co.'s No. 2 M. B. Fisher, top sand 3,526 feet, initial production 127 bbls. per hour through eleven-sixteenths-inch tubing choke, total depth 3,550 feet. Magnolia Petroleum Co.'s No. 5 Davis, top sand 3,570 feet, initial production 192 bbls. per hour through 1-inch tubing choke. total depth 3,590 feet. Same company's No. 2 Orms, top sand 3,548 feet, initial production 185 bbls. per hour through 1-inch tubing choke, total depth 3,581 feet. Margay Oil Co.'s No. 2 Christian, top sand 3,679 feet, initial production 140 bbls. per hour through 1¼-inch tubing choke, total depth 3,709 feet. Mullendore & Berry's No. 1 George Anderson, top sand 3,501 feet, initial production 125 bbls. per hour through various chokes, total depth 3,526 feet. Nash & Windfohr's No. 1 C. Jones, top sand 3,603 feet, initial production 165 bbls. per hour through 1-inch tubing choke, total depth 3,648 feet. Petroleum Finance Corp.'s No. 1 Kinsell, top sand 3,647 feet, initial production 86 bbls. per hour through three-fourths-inch tubing choke, total depth 3,679 feet. B. F. Phillips' No. 1 B. F. Phillips, top sand 3,571 feet, initial production 216 bbls. per hour through open tubing, total depth 3,600 feet.

Prairie Oil & Gas Co.'s No. 4 Isley, top sand 3,489 feet, initial production 90 bbls. per hour through three-fourths-inch tubing choke, total depth 3,499 feet. Roeser & Pendleton's No. 2 Christian, top sand 3,564 feet, initial production 150 bbls. per hour through three-fourths-inch tubing choke, total depth 3,610 feet. Roeser & Pendleton's No. 1 Hopkins, initial production 130 bbls. per hour from sand topped at 3,538 feet, total depth 3,558 feet. Shasta Oil Co.'s No. 1-B G. W. Richey, top sand 3,542 feet, initial production 150 bbls. per hour through various chokes, total depth 3,577 feet. Shell Petroleum Corp.'s No. 2 H. Hampton, top sand 3,605 feet, initial production 92 bbls. in 30 minutes through open tubing, total depth 3,652 feet. E. A. Showers and others' No. 1 Thad Snoddy, top sand 3,585 feet, initial production 110 bbls.

per hour through various chokes, total depth 3,605 feet.

Sinclair Oil & Gas Co.'s No. 2 M. Lawson, location abandoned. Same company's No. 13 Moncrief, top sand 3,580 feet, initial production 150 bbls. in 40 minutes through open tubing, total depth 3,604 feet. Same company's No. 14 Moncrief, top sand 3,540 feet, initial production 165 bbls. in 45 minutes through open tubing, total depth 3,565 feet. Stanolind Oil & Gas Co.'s No. 1 Beulah Jones, top sand 3,632 feet, initial production 160 bbls. per hour through 2-inch tubing choke, total depth 3,682 feet. Stanolind and Simms Oil Co.'s No. 2 Percy McGeorge, top sand 3,440 feet, initial production 228 bbls. per hour through open tubing, total depth 3,476 feet.

Sun Oil Co.'s No. 6 Haynes, top sand 3,590 feet, initial production 130 bbls. per hour through 2-inch tubing choke, total depth 3,621 feet.

Sun Oil Co.'s No. 2 Shoultz, top sand 3,665 feet, initial production 140 bbls. per hour through open tubing, total depth 3,672 feet. Same company's No. 1 D. G. Sparks, top sand 3,643 feet, initial production 70 bbls. per hour through open tubing, total depth 3,662 feet. Superior Oil Co.'s No. 2 L. C. Ingram, top sand 3,499 feet, initial production 156 bbls. in 50 minutes through 1-inch tubing choke, total depth 3,565 feet. The Texas Company's No. 4 Woods, top sand 3,549 feet, initial production 120 bbls. per hour through various chokes, total depth 3,588 feet. C. S. Thomas and others' No. 2 Everett, top sand 3,488 feet, initial production 100 bbls. per hour through various chokes, total depth 3,502 feet. Fox Wood and others' No. 1 J. B. Morgan, top sand 3,600 feet, initial production 120 bbls. per hour pinched, total depth 3,623 feet.

Wrightman Oil Co.'s No. 2 G. E. Adams, top sand 3,556 feet, initial production 146 bbls. per hour through 1½-inch tubing choke, total depth 3,582 feet. Yount Lee Oil Co.'s No. 3-A Davis, top sand 3,576 feet, initial production 88 bbls. per hour through eleven-sixteenths inch tubing choke, total depth 3,596 feet. Same company's No. 3 Flemster, top sand 3,590 feet, initial production 67 bbls. per hour through eleven-sixteenths inch tubing choke, total depth 3,616 feet. William Angle's No. 1 J. C. Claiborne, top sand 3,709 feet, initial production 50 bbls. per hour pinched, total depth 3,717 feet. C. K. Dawson and others' No. 1 Porter Griffin, top sand 3,530 feet, initial production 185 bbls. per hour through open tubing, total depth 3,586 feet. Harry Elliott's No. 1 R. Lacy, top sand 3,552 feet, initial production 150 bbls. per hour pinched, total depth 3,567 feet.

Gulf Production Co.'s No. 3 Hilburn, top sand 3,522 feet, initial production 140 bbls. per hour through three-fourths inch tubing choke, total depth 3,547 feet. Same company's No. 5 Hilburn, top sand 3,610 feet, initial production 100 bbls. per hour through three-fourths inch tubing choke, total depth 3,618 feet. Jones & O'Brien's No. 1 Lloyd, top sand 3,585 feet, initial production 125 bbls. per hour through open tubing, total depth 3,597 feet. Magnolia Petroleum Co.'s No. 2 Sam Orr, initial production 180 bbls. per hour through 1-inch tubing choke, total depth 3,581 feet. Oliphant's No. 4 Peterson, top sand 3,607 feet, initial production 60 bbls. in 15 minutes through 1-inch tubing choke, total depth 3,622 feet. W. R. Perkins and others' No. 2 Bean, top sand 3,607 feet, initial production 180 bbls. per hour through open tubing, total depth 3,628 feet.

Shell Petroleum Corp.'s No. 2-A J. S. Elder, top sand 3,537 feet, initial production 135 bbls. per hour through open tubing, total depth 3,591 feet. Sinclair Oil & Gas Co.'s No. 17 Cole, top sand 3,691 feet, initial production 150 bbls. in 110 minutes through open tubing, total depth 3,693 feet. Same company's No. 3-B King, top sand 3,431 feet, initial production 150 bbls. in 40 minutes through open tubing, total depth 3,456 feet. Choctaw Oil Co.'s No. 1 H. T. Elder initial production 96 bbls. per hour through three-fourths inch tubing choke, total depth 3,580 feet. Stanolind Oil & Gas Co.'s No. 1 Clayton, top sand 3,510 feet, initial production 136 bbls. per hour through tubing, total depth 3,566 feet. Sun Oil Co.'s No. 11 Hilburn & Lloyd, top sand 3,654 feet, initial production 95 bbls. per hour through three-fourths inch tubing choke, total depth 3,666 feet. The Texas Company's No. 2 Baxter, top sand 3,634 feet, initial production 160 bbls. per hour through three-fourths inch tubing choke, total depth 3,663 feet.

Hill County

Hill-Tex Oil Co.'s No. 1 Beck, dry and abandoned, total depth 4,001 feet. H. H. Hode's No. 1 H. Gilmer, dry and abandoned, total depth 930 feet.

Houston County

Phillips and others' No. 1 Kennedy, location abandoned.

Polk County

Humble Oil & Refining Co.'s No. 1 West Texas Lumber Co., dry and abandoned, total depth 1,400 feet.

Rusk County

A. W. Jones Oil Co.'s No. 1 Menefee, junked and abandoned, total depth 2,758 feet. DeArman and others' No. 2 King, top sand 3,632 feet, initial production 150 bbls. per hour pinched through tubing, total depth 3,683 feet. West Florida Oil Co.'s No. 1 Andy Givens, top sand 3,621 feet, initial production 150 bbls. per hour pinched through tubing, total depth 3,639 feet. Empire Gas & Fuel Oil Co.'s No. 3 Leverett, top sand 3,722 feet, initial production 150 bbls. per hour pinched through tubing, total depth 3,748 feet.

Gulf Production Co.'s No. 10-C C. E. Christian, top sand 3,663 feet, initial production 100 bbls. per hour pinched through tubing, total depth 3,675 feet. Same company's No. 11-C C. E. Christian, top sand 3,718 feet, initial production 119 bbls. per hour through three-fourths inch tubing choke, total depth 3,734 feet. Navarro Oil Co.'s No. 5 R. M. Brightwell, top sand 3,618 feet, initial production 85 bbls. per hour through 1¼-inch tubing choke, total depth 3,658 feet. Shell Petroleum Corp.'s No. 8 Rosa Russell, top sand 3,648 feet, initial production 128 bbls. per hour through open tubing, total depth 3,681 feet. Smith & Bohlson's No. 1 Terrell, top sand 3,636 feet, initial production 90 bbls. per hour through three-fourths inch tubing choke, total depth 3,639 feet. Sun Oil Co.'s No. 7 J. R. Beall, top sand 3,593 feet, initial production 97 bbls. per hour through three-fourths inch tubing choke, total depth 3,607 feet.

Tidal Oil Co.'s No. 5 W. P. Moore, top sand 3,717 feet, initial production 300 bbls. per hour through open tubing and casing, total depth 3,579 feet. Same company's No. 6 W. P. Moore, top sand 3,717 feet, initial production 105 bbls. per hour through open tubing, total depth 3,720 feet. Adams & Lyle's No. 1 L. P. Thrash, top sand 3,713 feet, initial production 130 bbls. per hour through open tubing, total depth 3,727 feet. British-American's No. 4 Kangerga, top sand 3,608 feet, initial production 162 bbls. in 12 minutes through open tubing and casing, total depth 3,638 feet. Bussa and others' No. 2 Britt, top sand 3,693 feet, initial production 120 bbls. per hour through open tubing, total depth 3,638 feet. Cornelius and others' No. 1 Neal Turner, top sand 3,769 feet, initial production 96 bbls. per hour through open tubing, total depth 3,740 feet. Golding & Murchison's No. 2 Ida L. Kinney, top sand 3,610 feet, initial production 70 bbls. per hour through open tubing, total depth 3,662 feet. Golding & Murchison's No. 3 Kinney, top sand 3,588 feet, initial production 60 bbls. per hour through open tubing, total depth 3,662 feet.

Gulf Production Co.'s No. 5 Grissom, top sand 3,709 feet, initial production 90 bbls. per hour through three-fourths inch tubing choke, total depth 3,729 feet. Same company's No. 1 Johnson, location abandoned. Same company's No. 1-A Redford, location abandoned. P. L. Hoffman's No. 1 Will Rollins, top sand 3,649 feet, initial production 300 bbls. per hour through open tubing, total depth 3,670 feet. Hooper and others' No. 1 Deason, top sand 3,620 feet, initial production 80 bbls. per hour through 2-inch tubing choke, total depth 3,680 feet.

Humble Oil & Refining Co.'s No. 3 M. D. Caldwell, top sand 3,757 feet, initial production 77 bbls. per hour through three-fourths inch tubing choke, total depth 3,781 feet. Same company's No. 1 Leah Hill, top sand 3,714 feet, initial production 83 bbls. per hour through three-fourths inch tubing choke, total depth 3,694 feet. H. L. Hunt's No. 1 A. B. Wooley, top sand 3,673 feet, initial production 100 bbls. per hour through 2½-inch tubing choke, total depth 3,778 feet. M. & G. Oil Co.'s No. 1 Minor, top sand 3,810 feet, initial production 120 bbls. per hour through open tubing, total depth 3,816 feet. Oliphant and others' No. 1 W. Alford, top sand 3,775 feet, initial production 127 bbls. per hour through open tubing, total depth 3,782 feet. Prime and others' No. 1 Stewart, top sand 3,758 feet, initial production 150 bbls. per hour through open tubing, total depth 3,784 feet. R. M. V. Oil Co.'s No. 5-A J. A. Bridwell, top sand 3,600 feet, initial production 175 bbls. per hour through open tubing, total depth 3,622 feet.

Sinclair Oil & Gas Co.'s No. 11 Kinney, top sand 3,678 feet, initial production 150 bbls. per hour pinched through tubing, total depth 3,678 feet. Same company's No. 19 Kinney, top sand 3,642 feet, initial production 150 bbls. per hour pinched through tubing, total depth 3,654 feet. Same company's No. 4 Wilson, top sand 3,652 feet, initial production 150 bbls. in 45 minutes through tubing, total depth 3,662 feet. Same company's No. 5 Wilson, top sand 3,655 feet, initial production 150 bbls. in 45 minutes through tubing, total depth 3,665 feet. The Texas Company's No. 1 First Guaranty State Bank, top sand 3,660 feet, initial production 105 bbls. per hour through 1-inch tubing choke, total depth 3,690 feet. Same company's No. 3 First Guaranty State Bank, top sand 3,715 feet, initial production 108 bbls. per hour through three-fourths inch tubing choke, total depth 3,751 feet. Same company's No. 5 Pinkston, top sand 3,603 feet, initial production 75 bbls. per hour through open tubing, total depth 3,650 feet. Tulsa Oil Co.'s No. 1 J. E. Wheelis, top sand 3,792 feet, initial production 175 bbls. per hour through open tubing, total depth 3,807 feet. Vaughan and others' No. 2 Alford, top sand 3,821 feet, initial production 55 bbls. in 55 minutes through open tubing, total depth 3,825 feet. Carl G. Willie's No. 1 Joe Lee, top sand 3,814 feet, initial production 100 bbls. per hour through open tubing, total depth 3,817 feet.

Smith County

Big Indian Oil Co.'s No. 2 Wolford, top sand 3,720 feet, initial production 160 bbls. per hour through open tubing, total depth 3,728 feet. Brookshire and others' No. 1 S. S. Cook, top sand 3,755 feet, initial production 150 bbls. in 24 hours through tubing, total depth 3,758 feet. A. J. Earlewine's No. 1-A S. S. Cooke, top sand 3,705 feet, initial production 160 bbls. per hour through tubing, total depth 3,714 feet.

Sinclair Oil & Gas Co.'s No. 6-A Jar-

GAS FROM TIOGA FIELD MAY SOON BE PIPED TO SYRACUSE CONSUMERS

By Special Correspondent

CORNING, N. Y., Nov. 7.—J. French Robinson of the Lycoming Natural Gas Co. today stated that negotiations between Niagara-Hudson Power Corp. and Lycoming Natural Gas Co., a subsidiary of the Standard Oil of New Jersey, to pipe Tioga Field natural gas to Syracuse and surrounding territory have reached a stage where actual signing of a contract is imminent.

Announcement of the proposed contract was hailed as a deal of great importance, paving the way for the introduction of natural gas on a large scale into important manufacturing cities in central New York State. Lycoming owns or controls a large percentage of the gas production from both Wayne and Tioga Fields.

The reopening of activities in construction of the John B. Tonkin 20-inch gas supply line from the Tioga Field northeast toward Syracuse, which was halted at the New York-Pennsylvania State line, is now looked for as well as the construction of a small supply line north from the Wayne Field toward Penn Yan following the completion of the impending contract. The Lycoming company has gas sales contracts with many Tioga and Wayne Field operators for purchase of gas from wells in these areas and the proposed contract puts a finishing touch on a vast Lycoming development program to drill for and market gas from fields near this city.

The sale of gas from the two fields upon the completion of the line, for which river crossings have been under construction for some time, will mean ultimate collection by the landowner of royalties in wells on farms and town lots in both states.

Among the Tioga Field operating companies which have agreements with Lycoming are: Allegany Gas, for surplus unused after supplying subsidiary companies, Penn United Gas, Benedum-Trees and Penn Ohio. In the Wayne Field numerous operators have made similar contracts including: Tri-State Gas & Electric, Earl J. De Golier, Pentoga Gas, J. B. Reed, Decker and others. Many of the other operators in the field, Cunningham Natural Gas Corp., Eastern States, Oriskany Drilling and others, have contracted with Belmont Quadrangle Drilling Corp. and have had an outlet for some time for gas in wells owned by these groups.

Three dry holes were completed in the Wayne, N. Y., area in the past week. The Burns Oil & Gas Co.'s No. 1 Clark, located south of the producing area, was abandoned after it was drilled 8 feet into the Oriskany sand, where a dose of salt water broke in. The failure of the Stoutenberg and Sayre wells of the Penntoga Gas Co. near Penn Yan was a disappointment to the lease owners therabouts. The Sayre well produced about 100,000 feet of gas per day, or not enough for commercial purposes. It is at a total depth of 1,801 feet. The Stoutenberg test may be drilled deeper. The Cunningham Natural Gas Co.'s No. 1 Ward, located about 5 miles from Penn Yan, has been reported abandoned. It showed some shale gas.

The Hammondsport Natural Gas Co. and the New York Natural Gas Co. have started tests near Hammondsport, N. Y.

J. B. Reed expects the completion of two wells in the Wayne Field next week. No. 1 Macabbee and No. 1 Rose Houck in the Wayne village field are about due. Burns Oil & Gas Co. has started another drilling well on the Sumner property in the village.

Over the line in Pennsylvania where the big gas production lies in the 4,000-foot Oriskany sand zone, the Lycoming Natural Gas was reported to be drilling No. 2 Hoyt very close to the top of the sand. The Lycoming company was drilling at 5,245 feet in No. 1 Wheeler; at 3,100 feet in No. 1 Herrington, and at 1,400 feet in No. 2 Boom, all in the Tioga Field. North Branch Gas Co.'s No. 1 Colegrove was drilling at 3,600 feet and No. 1 Middaugh was drilling at 4,600 feet. Both are in Lawrence Township, Tioga County. Duff and others' No. 1 Olson in Bradford County was shut down at 5,658 feet and the Wells Co.'s No. 1 County Farm was cementing at 4,878 feet.

The New York Central Electric Corp. has been granted a permit to supply gas to the village of Cohocton and the town, or township, of Cameron. The Iroquois Gas Co.'s line from the Wayne Field to Dansville, N. Y., passes the village of Cohocton. The town of Cameron has an available supply from two sources, the Columbia Gas & Electric Co.'s line and that of the Allegany Gas Co.

FLEXIBLE THINGS ENDURE

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vis, top sand 3,678 feet, initial production 105 bbls. in 30 minutes through open tubing, total depth 3,688 feet. Same company's No. 7-A Jarvis, top sand 3,693 feet, initial production 70 bbls. in 30 minutes through open tubing, total depth 3,698 feet. Same company's No. 2-C Jarvis, top sand 3,686 feet, initial production 150 bbls. in 2 hours pinched through tubing, total depth 3,688 feet. Same company's No. 1 Bobbie Wright, top sand 3,685 feet, initial production 150 bbls. in 40 minutes through tubing, total depth 3,702 feet. Same company's No. 6 Dora Wright, top sand 3,696 feet, initial production 150 bbls. in 50 minutes through open tubing, total depth 3,702 feet. Same company's No. 7 Dora Wright, top sand 3,720 feet, initial production 150 bbls. in 40 minutes through open tubing, total depth 3,728 feet. Same company's No. 8 Dora Wright, top sand 3,738 feet, initial production 150 bbls. in 40 minutes through tubing, total depth 3,743 feet. Same company's No. 4 Mrs. R. G. Wright, top sand 3,679 feet, initial production 150 bbls. in 40 minutes through tubing, total depth 3,685 feet. Same company's No. 6 Mrs. R. G. Wright, top sand 3,697 feet, initial production 150 bbls. in 40 minutes through tubing, total depth 3,707 feet. Same company's No. 1 W. B. Wright, top sand 3,690 feet, initial production 150 bbls. in 40 minutes through tubing, total depth 3,704 feet. The Texas Company's No. 6 J. W. Wilson, top sand 3,674 feet, initial production 103 bbls. per hour through three-fourths inch tubing choke, total depth 3,680 feet.

Upshur County

Cal-Pet Corp.'s No. 1 W. F. Glenn, top sand 3,610 feet, initial production 95 bbls. per hour through three-fourths inch tubing choke, total depth 3,644 feet. Cal-Pet Corp.'s No. 4 Walker, top sand 3,594 feet, initial production 102 bbls. per hour through three-fourths inch tubing choke, total depth 3,652 feet. Daisy Oil & Gas Co.'s No. 1 B. F. Phillips, top sand 3,706 feet, top Pecan Gap 2,624 feet, base 3,029 feet, top Austin chalk 3,625 feet, dry and abandoned, total depth 3,730 feet. Johnson Brothers' No. 1 Hargrove, top sand 3,709 feet, initial production 500 bbls. in 7 hours open through tubing, total depth 3,712 feet. Magnolia Petroleum Co.'s No. 2 Blackwell, top sand 3,661 feet, initial production 130 bbls. per hour through 1-inch tubing choke, total depth 3,666 feet. Manson Oil Co.'s No. 2 T. A. Well, top sand 3,679 feet, initial production 150 bbls. per hour through various chokes, total depth 3,709 feet.

Sabine Oil Co.'s No. 4-C Collins, top sand 3,705 feet, initial production 112 bbls. per hour pinched through tubing, total depth 3,711 feet. Same company's No. 3 J. W. Falvey, top sand 3,730 feet, initial production 150 bbls. per hour through various chokes, total depth 3,740 feet. Shell Petroleum Corp.'s No. 5 C. C. Landers, top sand 3,699 feet, initial production 50 bbls. in 30 minutes through open tubing, total depth 3,727 feet. Sorrells & Duffy's No. 1 Wooden, top sand 3,680 feet, top Pecan Gap 2,440 feet, base Pecan Gap 2,783 feet, top Austin chalk 3,573 feet, base 3,623 feet, dry and abandoned, total depth 3,793 feet. Sun Oil Co.'s No. 1 A. J. Watkins, top sand 3,696 feet, initial production 100 bbls. per hour through various chokes, total depth 3,712 feet. Trico Oil Co.'s No. 1 A. D. Adkins, top sand 3,749 feet, initial production 87 bbls. per hour through 1-inch tubing choke, total depth 3,765 feet.

Ellis County

Community Oil Co.'s No. 1 Nash, location abandoned.

Freestone County

Haley & Clark's No. 1 M. C. Lanchaster, location abandoned.

LEWIS T. ROBINSON DEAD

Lewis Taylor Robinson, 63, engineer in charge of the general engineering laboratory of the General Electric Co., died suddenly from a heart attack at his home in Schenectady, N. Y., November 3.

LEGISLATURE MUST AVOID STRAIGHTJACKET

(Continued from Page 23)

an unreasonable quantity of oil unrecoverable in the ground.

Three Fundamentals

Having stated some of our present deficiencies, I shall present here a plan, or rather a restatement, of three fundamentals which are designed to point a way onto firmer ground:

First, provision should be made by interstate compact, approved by Congress, for putting on a permanent basis the periodical forecasting of demand, the setting of state production quotas to meet that demand, and enforcement of such quotas, all of which are now being undertaken informally by the regulatory commissions of Oklahoma, Kansas and Texas under the agreement of September 13. Such a compact should create a permanent interstate advisory body, formally recognized, which could perform functions of co-ordination. Enforcement within each state would rest with the state regulatory body constituted by its own laws.

Second, state laws, which are uniform in principle if not in detail, are ultimately needed within the compacting states. These might well include, among other things, provisions (1) prohibiting drilling or the extension of pipe lines into new fields without a showing of public convenience and necessity; (2) requiring wide spacing of wells; (3) prohibiting waste of gas and gas energy both above and below ground; (4) fixing minimum gas-oil ratios; (5) authorizing regulatory bodies to require ratable taking within each field and between competing fields; (6) authorizing unit operation; (7) and giving the state regulatory body broad powers to require production methods which will insure maximum recovery from the ground. One function of the interstate advisory board should be to draft and recommend such laws from time to time if the compact itself does not outline them. But the co-ordination of various state production programs is a more pressing matter than uniformity of state laws; the first objective of a compact should be to get the states to co-operating on a permanent basis. Uniform laws, when adopted, might reasonably go beyond the production stage and aim at correction of the demoralized marketing methods of the industry, but that is beyond the scope of the present discussion.

Federal Participation

Third, as recommended by Secretary Wilbur, a joint federal and state fact-finding body for arriving at an equation of domestic and foreign production and imports should be created by the compact of the states and with the approval of the Congress. This joint body might be authorized to negotiate with foreign producers and assist in negotiations with foreign governments. Its state members might be also members of the interstate advisory board so that the agreements made could bring the states' police power directly into play for their enforcement. Federal participation, in the long run, is essential for the protection of the consuming public.

This three-point program — co-ordination of state production by an interstate compact, uniformity of conservation principles by a compact or otherwise, and equation of foreign and domestic production by a joint federal-state board created by the compact — can be accomplished just as quickly as necessity demands. It is to be hoped that the beginning made by Oklahoma, Kansas and Texas, which is a temporary compact enforced partly by martial law, will grow into something permanently effective, or else a continuation of such sprees as we have seen in East Texas will very quickly convert the indigestion of the oil industry into something like appendicitis.

Meanwhile, there are certain things that can be done without waiting for legislation. I hope that Kansas, Oklahoma and Texas continue their joint curtailment program, and their public service commissions and the Oil States Advisory Committee continue to co-operate.

Adjustment of Imports

The Federal Oil Conservation Board will continue to supply such forecasts of supply and demand as may be helpful. The question of relief from excessive imports while we are correcting our domestic situation can be taken up by the official state commissions directly with each importing company. While a federal statute prohibits agreements between individuals looking toward import restrictions, I know of nothing to prohibit a state from such discussions, conducted formally by its regulatory body for the purpose of acquiring information on which to base its own proration program. Imports for the first nine months of 1931 were about 26 per cent below the comparable 1930 figures; you are familiar with the efforts of the Federal Oil Conservation Board to that end.

While further adjustment of imports may be desirable, it will not cure all of our difficulties, the greatest of which lie within our own borders, and it should be kept in mind from the standpoint of national interest that we are exhausting our own reserves of this vital resource at a rate out of all proportion to the ratio between our own reserves and those of the rest of the world. As you all know, the United States, with less than 20 per cent of the world's reserves, is producing and consuming over 60 per cent of current world production.

The oil industry has a great responsibility and a great opportunity. Its market reaches to every family and every industry in the country. It deals with a national resource in which every citizen has a vital interest. If conducted on the basis of a trusteeship of a basic commodity, avoiding unnecessary wastes in production and distribution, the industry should be able to furnish an adequate supply of oil and its derivatives of good and uniform quality at fair prices to the consumer, and to make a fair return on its invested capital.

These purposes can be accomplished largely, within the framework of existing laws and with a minimum of federal regulation if the industry will wholeheartedly co-operate in making effective the measures already initiated and the proposals which have been outlined. I have every confidence that the industry has or will develop the capacity and leadership to recognize its great opportunity and to discharge its equally great responsibilities.

PLAN CAMPAIGN AGAINST TAX RACKETEERS

(Continued from Page 22)

will not go off color during storage or transportation. The process is beyond the experimental stage and has been carried out successfully in commercial units of capacities up to 5,000 bbls. of gasoline a day. Speed is also an advantage of this method of treating.

Vapor lock and the improvements which have been made in fuel line design in automobiles is another favored subject at this meeting. Many of the refiners are paying particular attention to data on vapor lock, as the trend in gasoline manufacture is toward easier starting under adverse weather conditions. A survey under discussion indicates that in hot weather the permissible vapor pressure with 1931 automobiles is certainly less than 8 pounds per square inch and probably less than 7 pounds, if freedom from vapor lock in about 90 per cent of the cars is desired. These values, it is pointed out, apply to operation at sea level, while altitudes between 5,000 and 10,000 feet call for still lower, by 2 pounds, pressures.

Refining and Marketing Sessions

The divisions of refining and marketing opened their general committee sessions Monday night with E. J. Bullock acting as division chairman for the marketers in the absence of Edward G. Seubert, who has been called to Europe on business, and W. R. Boyd presiding for the refiners.

The individual committee meetings held Monday for the purpose of bringing out recommendations and resolutions to be submitted eventually to the board of directors were those of the following groups: Refinery statistics and economics, subcommittee on transportation regulations, committee D-2 (A.S.T.M.) on petroleum products and lubricants, fire prevention in refineries, disposal of refinery wastes, subcommittee on gasoline tax evasion, subcommittee on diversion and reconsignment, on railroad transportation, on uniform gasoline tax law, on fire prevention in marketing and on the various code groups.

Group meeting today were on standardization of refinery equipment, statistics, and automotive transportation in marketing.

The marketing division is holding its general session tonight. Subjects presented at this meeting are solely on the subject of gasoline tax evasion and how it is being combatted, and on the formulation of uniform gasoline tax laws to prevent tax evasion. The keynote of Chairman Seubert's report, read by Mr. Bullock, strikes on the tax evasion problem and the necessity for prompt and drastic action on the part of the industry.

THE OIL MAN'S CALENDAR

NOVEMBER

10—Chicago, Ill., Oil States Advisory Committee.

10-12—Chicago, Ill., twelfth annual meeting, American Petroleum Institute, Stevens Hotel.

16-21—Pittsburgh, Pa., third International Conference on Bituminous Coal, Carnegie Institute.

30-Dec. 4—New York, N. Y., annual meeting, American Society of Mechanical Engineers.

DECEMBER

2-3—Indianapolis, Ind., Indiana Petroleum Association, Hotel Severin.

7-12—Atlantic City, N. J., trade show, motor and equipment—National Standard Parts Association.

9-11—Atlantic City, N. J., American Institute of Chemical Engineers.

9-11 — Omaha, Neb., Nebraska Petroleum Marketers, Hotel Paxton.

28-31—Tulsa, Okla., Geological Society of America, Mayo Hotel.

1932

JANUARY

9-15—Detroit, Mich., convention and road show, American Road Builders' Association, Airport Building.

9-16—New York, National Automobile Show.

11-12—Fargo, N. D., North Dakota Division, Northwest Petroleum Association, Waldorf Hotel.

25-29 — Detroit, Mich., annual meeting, Society of Automotive Engineers.

30-Feb. 6—Chicago, Ill., National Automobile Show.

FEBRUARY

9 — Louisville, Ky., Kentucky Petroleum Marketers Association, Brown Hotel.

9-10 — Des Moines, Iowa, eleventh annual convention, Iowa Petroleum Association, Fort Des Moines Hotel.

MARCH

17-19 — Oklahoma City, Okla., American Association of Petroleum Geologists.

APRIL

11-16—Boston, Mass., ninth annual convention, American Oil Burner Association.

21-22—Cleveland, Ohio, semiannual meeting, National Petroleum Association, Hotel Cleveland.

REFINERS CONTINUE TO CURTAIL RUNS

(Continued from Page 25)

representative of normal conditions. As a result of stabilizing crude prices and curtailing production to an economic limit, there is no great inducement for these refiners to run to capacity, with the possibility of again breaking through the present level of gasoline prices, which most of these plants say they need to get in order to operate.

West Texas

Practically no change was made in the operations of the West Texas refineries during the early part of November and crude schedules have been established for the month at about the same figures as in October. Except for the resumption of operations in the Rio Grande Oil Co. plant at El Paso, there was no change in the status of the operating and shut down plants.

Kansas

One plant was added to the list of operating refineries in Kansas for November and one was removed. The plant to resume operations is that of the Derby Oil & Refining Co. at Wichita, and the plant shut down is that of the Sinclair Refining Co. at Argentine. Except for the substantial increase in the crude runs at the Kanotex refinery and the large decrease in the Skelly Oil Co. runs at Eldorado, there was little change in the schedules of the individual plants.

North Louisiana and Arkansas

A reduction of 6,000 bbls was reported in the scheduled runs of the refineries in the Arkansas area, occasioned partly by the shutting down of the crude stills of the Houston Oil Co. at Camden, and the lbaance is due to curtailed operations in Root Refining Co. and the Lion Oil & Refining Co. Practically no change is shown in the operation of the North Louisiana group.

REFINERY OPERATIONS IN WEST TEXAS

(Plants which have been in operation during the past year)

Company and location—	Daily capacity	Runs Nov. 1	Runs Oct. 1
Big Spring Refining Co., Big Spring	2,500	1,000	(*)
Big Lake Refining Co., Big Lake	2,000	(*)	(*)
Bluebonnett Oil Refining Co., Wickett	5,000	(*)	(*)
Burford Oil Co., Pecos City	6,000	3,500	4,800
Coltex Refining Co., Colorado	10,000	6,100	6,500
Concho Refining Co., San Angelo	300	200	200
Coseden Oil Co., Big Spring	15,000	5,000	4,500
Deer Oil Corp., Luling	2,500	(*)	(*)
Ewmo Oil Corp., Hawley	1,000	200	200
Grayburg Oil Co., San Antonio	6,000	700	640
Great West Refining Co., Big Spring	3,500	2,500	3,000
Gulf Oil & Refining Co., Sweetwater	5,000	5,000	5,000
Humble Oil & Refining Co., San Antonio	5,000	1,400	1,500
Humble Oil & Refining Co., McCamey	15,000	(*)	(*)
Magnolia Petroleum Co., Luling	5,000	4,600	5,400
Marathon Oil Co., Del Rio	5,000	1,000	1,500
Misko Refineries, Inc., Laredo	1,500	850	900
Mid-Tex Refining Co., Midland	2,500	(*)	(*)
Motor Fuel Products Co., Laredo	2,000	500	500
Pasotex Petroleum Co., El Paso	14,000	4,000	5,000
Pioneer Oil & Refining Co., Somerset	1,500	750	900
Richardson Refining Co., Big Spring	6,000	(*)	(*)
Rio Grande Oil Co., El Paso	6,000	3,000	(*)
San Angelo Refining Co., San Angelo	2,000	200	200
Sweetwater Oil & Refining Co., Sweetwater	2,000	(*)	(*)
The Texas Company, San Antonio	3,000	2,500	2,500
The Texas Company, El Paso	2,000	1,000	1,000
Tonkawa Petroleum Co., Pyote	5,000	1,500	1,500
Texas Mexican Oil & Refining Co., Laredo	600	500	500
Texas Petroleum Products Co., Somerset	1,500	460	600
Wickett Refining Co., Wickett	2,500	600	600
Total	148,900	47,060	47,440

*Shut down.

REFINERY OPERATIONS IN NORTH CENTRAL TEXAS

(Plants which have been in operation during the past year)

Company and location—	Daily capacity	Runs Nov. 1	Runs Oct. 1
All State Refining Co., Thrall	3,000	(*)	(*)
American Refining Properties, Wichita Falls	6,000	(*)	1,300
Apache Refining Co., Sunray	4,000	600	1,500
Archer Refining Co., Megargel	1,500	450	600
Atlantic, Pacific & Gulf Refining Co., Wichita Falls	5,000	(*)	(*)
Carson, M. D., Brady	200	(*)	80
Continental Oil Co., Wichita Falls	6,000	2,000	2,500
Dale Oil & Refining Co., Electra	4,000	2,900	(*)
Deer Oil Corp., Brownwood	2,000	(*)	(*)
Dixon Creek Oil & Refining Co., Kings Mill	3,500	2,000	2,400
Echotex Refining Co., Echo	300	200	200
Empire Oil & Refining Co., Gainesville	5,000	3,000	3,400
Falls Refining Co., Wichita Falls	2,000	1,000	1,000
Gulf Refining Co., Fort Worth	16,000	6,000	5,600
Humble Oil & Refining Co., Breckenridge	2,000	(*)	(*)
Humble Oil & Refining Co., Chilton	4,000	1,300	1,100
Humble Oil & Refining Co., Boggy Creek	5,000	3,920	2,500
Iowa Park Producing & Refining Co., Iowa Park	2,500	(*)	(*)
Kent Refining Co., Minerva	2,000	(*)	(*)
Kent Refining Co., Angus	4,000	(*)	(*)
LaSalle Petroleum Co., Burkburnett (Noble)	3,500	(*)	(*)
Macmillan Petroleum Co., Isom	5,000	2,000	2,000
Magnolia Petroleum Co., Fort Worth, No. 1	12,000	4,200	4,200
Magnolia Petroleum Co., Fort Worth, No. 2	6,000	3,200	3,300
Magnolia Petroleum Co., Corsicana	5,000	4,500	4,000
Marathon Oil Co., Fort Worth	5,000	4,000	4,500
Muenster Refining Co., Muenster	300	50	50
Norgold Refining Co., Olney	200	60	60
Obar Refining Co., Coleman	300	200	200
Olney Oil & Refining Co., Olney	2,500	(*)	2,000
Oriental Oil Co., Dallas	5,000	1,500	1,500
Panhandle Refining Co., Wichita Falls	5,000	3,000	3,500
Petroleum Refractionating Co., Pampa	6,500	6,000	6,400
Phillips Petroleum Co., Isom	18,000	16,000	18,000
Primrose Refining Co., Wichita Falls	2,500	2,500	1,000
Sinclair Refining Co., Fort Worth	5,000	4,000	(*)
Simms Oil Co., West Dallas	4,500	3,000	3,000
Southland Refining Co., Olney	1,000	(*)	(*)
Seymour Refining Co., Seymour	250	200	200
Star Refining & Producing Co., Fort Worth	1,500	1,000	1,000
Superior Refining Co., Tiffin	2,000	(*)	(*)
Taylor Refining Co., Taylor	6,000	1,200	1,000
Taxman Refining Co., Wichita Falls	2,500	(*)	(*)
Texas Eagle Refining Co., Fort Worth	500	(*)	(*)
The Texas Company, Dallas	16,000	15,000	15,000
The Texas Company, Amarillo	4,000	3,000	3,000
Tidal Western Refining Co., Burkburnett	3,000	(*)	(*)
Texas Pacific Coal & Oil Co., Fort Worth	3,000	2,000	2,000
Texas Pacific Coal & Oil Co., Caddo	1,000	800	700
Waggoner Refining Co., Electra	3,400	3,500	(*)
Wilcox Oil & Gas Co. (Pampa Refining Co.), Pampa	4,000	2,500	(*)
Young Refining Co., Archer City	250	(*)	(*)
Total	212,950	106,990	98,790

*Shut down.

REFINERY OPERATIONS IN EAST TEXAS

(Plants which have been in operation during the past year)

Company and location—	Daily capacity	Runs Nov. 1	Runs Oct. 1
Arrow Refining Co., Overton	2,500	500	(*)
Beacon Oil & Refining Co., Friars Switch	2,500	2,000	(*)
Boone Refining Co., Arp	500	325	500
Central Refining Co., Friars Switch	10,000	(*)	(*)
Citizens Refining Co., Gladewater	800	(*)	(*)
Constantin Refining Co., Overton	3,000	(*)	200
East Texas Refining Co., Henderson	6,000	4,000	4,000
East Texas Refining Co., Longview	10,000	4,000	4,000
Gladetex Refining Co., Gladewater	500	200	300
Gladewater Refining Co., Gladewater	1,000	240	250
Indian State Oil Co., Gladewater	1,000	350	400
Kilgore Refining Co., Kilgore	1,500	700	1,000
Overton Refining Co., Overton	3,500	800	1,000
Petroleum Refractionating Co., Longview	10,000	(*)	
Rusk Refining Co., Overton	3,000	275	(*)
Sinclair Refining Co., Gladewater	5,000	1,500	1,500
Southern Oil & Refining Co., Kilgore	2,500	1,500	1,500
Slack Petroleum Co., Camps Switch	1,500	(*)	(*)
Taylor Refining Co., Tyler	15,000	3,600	4,000
Total	78,800	18,890	17,350

*Shut down.

REFINERY OPERATIONS IN ARKANSAS

(Plants which have been in operation during the past year)

Company and location—	Daily capacity	Runs Nov. 1	Runs Oct. 1
James H. Berry & Sons, Waterloo	2,000	1,000	1,000
Henry H. Cross Co., Smackover	6,000	4,000	4,000
Houston Oil Co., Camden	6,000	(*)	2,700
Kettle Creek Refining Co., Pearson	5,000	2,200	3,000
Lion Oil & Refining Co., El Dorado	12,000	6,400	7,000
Macmillan Petroleum Products Co., Norphlet	1,800	2,000	2,000
Ouachita Valley Refining Co., El Dorado	2,000	1,200	775
Root Refining Co., El Dorado	10,000	4,000	5,000
Simms Oil Co., Smackover	3,000	2,600	2,700
Union Asphalt Co., El Dorado†	....	....	....
Total	47,800	23,400	29,195

*Dewaxing reduced East Texas residuum. †Reduces residuum purchased from Lion Oil & Refining Co., no crude run.

REFINERY OPERATIONS IN NORTH LOUISIANA

(Plants which have been in operation during the past year)

Company and location—	Daily capacity	Runs Nov. 1	Runs Oct. 1
Bayou State Refining Co., Hosston	750	(*)	(*)
Crystal Oil Refining Co., Shreveport	14,000	(*)	(*)
Louisiana Oil Refining Co., Shreveport, Bossier	19,000	17,000	17,000
Spartan Refining Co., Shreveport	10,000	7,500	7,000
Stanolind Oil & Gas Co., Superior	3,500	2,800	2,800
The Texas Company, Shreveport	7,000	(*)	(*)
Total	54,300	27,300	26,825

*Shut down.

REFINERY OPERATIONS IN KANSAS

(Plants which have been in operation during the past year)

Company and location—	Daily capacity	Runs Nov. 1	Runs Oct. 1
Altitude Petroleum Corp., Chanute	5,000	2,000	2,500
Barnsdall Refineries, Inc., Wichita	4,000	3,000	3,500
Derby Oil Co., Wichita	7,500	4,000	(*)
Eldorado Refining Co., Eldorado	4,500	2,500	2,700
Golden Rule Refining Co., Wichita	1,500	800	800
Kanotex Refining Co., Arkansas City	12,000	7,000	3,000
National Refining Co., Coffeyville	6,500	5,000	5,000
Phillips Petroleum Co., Kansas City	7,500	7,200	8,000
Shell Petroleum Corp., Arkansas City	22,000	14,000	15,000
Sinclair Refining Co., Coffeyville	12,000	11,000	10,000
Sinclair Refining Co., Argentine	9,500	(*)	4,000
Skelly Oil Co., Eldorado	23,000	11,500	16,100
Standard Oil Co. of Kansas, Neodesha	20,000	6,000	5,000
Vickers Petroleum Co., Potwin	3,500	2,000	1,330
White Eagle Oil Corp., Augusta	13,000	10,000	9,700
Total	151,500	86,000	88,130

*Shut down.

PRODUCTION TRENDS AND IMPROVEMENTS

(Continued from Page 26)

construction of equipment and intelligent operation.

Trend in Conservation

Everyone connected with the petroleum industry has been concerned to a greater extent each succeeding year with the proper conservation of oil and gas. Oil and gas are usually found together in underground reservoirs, and much effort is now being made to conserve and turn to use every portion of this most valuable gift of nature. Conservation, as it applies to the producing branch of the oil and gas industry, means the orderly and economical production and efficient utilization of these commodities so that the greatest number may receive the greatest possible benefit. Under this conception it has been observed that the industry is giving way to a more modern and businesslike understanding of the rights of the individual producers in a common source of supply as found in an oil and gas pool. Substantial headway has been made in recent years, from a conservation viewpoint, through a growing appreciation of the great value of gas energy as an important agency in efficiently and economically producing oil. This leads to the conclusion that by one means or another we are steadily coming nearer to the day of either voluntary or compulsory unitization of oil pool development and operation.

While the industry has inclined toward the adoption of unitization, it has been adopted and actually put into practice only in scattered instances. Surely the industry will not let go unnoticed the remarkable difference in the orderly and sensible development and operating program as demonstrated by some of the outstanding unit operations, as contrasted with the wild, unrestrained, and criminally wasteful procedure and practice followed in competitive fields. Unitization is the most ideal solution of our present day problem, as well as the most logical proposal yet advanced to promote orderly development and, consequently, conservation. Only a few short years ago the typical old time producer "saw red" when one even so much as mentioned "back pressure" to him. Those were the so-called "good old days" when wide open flow, swabbing, and high vacuum held sway. In other words, every possible means was followed to exhaust as rapidly as possible one of the most valuable elements in the producing formation—its gas energy. On the other hand, all experienced producers are now advocates of restricted production as a sound practice in the interest of conservation, because it results in a greater ultimate recovery through the better utilization of reservoir energy with the consequent improved control of water encroachment, thereby turning an old enemy of the oil producer to

good account through the benefits derived from such a controlled natural water drive.

"Conservation Conscious"

The growing tendency of the producing branch of the oil industry to become more "conservation conscious" necessarily carries with it the implication of the more willing adoption of development and operating policies designed to make true conservation possible. Obviously, an operator, once he becomes sold on the merits and benefits of such a policy, cannot consistently continue to drill two wells where one would suffice. Neither will he long continue drilling his wells deep in the pay sand and thereby hasten the encroachment of water; nor will he knowingly case his wells improperly, as has been common practice so often in the past, inevitably resulting in either the most serious form of water encroachment, wanton gas wastage, or both. Conversely, if he is a true conservationist, he will naturally so equip his wells as to be able to operate them without deliberate waste of inherent gas energy; and, moreover, he will naturally be more interested in, and concerned about, the manner in which his neighbors go about the job of drilling, equipping, and operating their wells.

Even though much is yet to be attained before we reach anything approaching perfection in development and production procedure and practice, substantial progress has been made. Despite the present frenzied drilling orgy in East Texas, or the wasteful practice of too close spacing of wells in a large portion of the deep Oklahoma City Pool, it is gratifying to report that many indications are found elsewhere which indicate real headway in recent years in improving uneconomical practices and in eliminating unsound methods from a conservation viewpoint.

Proration Benefits

Conservation of oil and gas in competitive areas has been furthered more by proration than by any other factor. Prior to the advent of proration, conservation was limited to a few areas. Wide open drilling and production rates under competitive conditions are not conducive to conservation, but are distinctly harmful to recoveries and economies possible under co-operative development and restricted production rates. Conservation in the noncompetitive pool is, of course, a common objective of all operators; and, therefore, receives the wholehearted support of each and every operator. The best examples in Texas today of such operation are Yates Pool, Van Pool, Cook Pool, Sugarland and Raccoon Bend Pools; and in California, Kettleman Hills. The conservation of oil and gas and the elimination of waste is obtained in all these pools by means of proration. In the event that proration should be abandoned in any of these pools, conservation would at once be either jeopardized or eliminated.

In the noncompetitive pools of Texas production procedure and practice is advancing in conformity with the highest standards of conservation. This is accomplished through detailed engineering studies of subsurface conditions and the subsequent development of new methods of production, such as the tubing of flowing wells and regulation of reservoir pressures in such manner as to distribute equitably the production of the pool in proportion to the ownership of the reservoirs.

In the competitive or unregulated pools a divergence of interest exists between the many operators, East Texas furnishing an example as to what extremes these conditions may attain before being forcibly regulated in some manner. Under such conditions as exist in East Texas prior to the recent conservation legislation, there was no accepted standard of ethics or production practice. Constructive leadership failed in its objective, due to the unwillingness of a small majority to realize the benefits of co-operation in accordance with the standards of conservation prevalent in the noncompetitive pools. Although operators as a whole have no common objective with respect to conservation, in parts of the pool small unitization projects are being discussed, and may be attempted in the near future.

Effect on Production Practice

More consideration is being given, and more engineering skill is being applied to properly completing and equipping oil wells than at any time in the history of the industry. Better grades of casing are now commonly used, and more care is exercised in making certain that permanent shutoffs are obtained in landing the water string of casing.

Rate of production of oil has been controlled in many areas by proration agreements. Reservoir gas has been conserved in flowing wells by tubing, bottom-hole chokes, surface chokes, and restricting the flow to secure low gas-oil ratios. Back-pressure control of wells has been extended by closing in casingheads, raising tubing, or installing smaller pumps. Bottom hole pressures are being determined for use as an index to satisfactory pressure conditions in the reservoir as caused by excessive withdrawal.

The greater realization of the importance of conserving gas energy has unquestionably resulted in the now fairly common practice of bringing wells in through tubing strings, which provides means of efficient control, and automatically and necessarily results in a more or less constant back pressure being carried on the producing horizon, and usually gives an added efficiency from reservoir energy.

This measure of progress has resulted in a rather remarkable improvement in the design, manufacture, and utilization of various types of well-head and other above-ground connections and equipment, all to the end of more easily accomplishing the conservation of formation energy and making for more efficient and complete utilization of the gas actually produced.

A much closer study than ever before is now given to the problem of edge-water encroachment, and some advance has been registered in the methods and controls used to make such encroachment even and uniform throughout the producing formation.

This control is largely a matter of uniform and slow withdrawal of oil and gas from the reservoir, with the attendant back pressure maintained, thus tending to assure a gradual up-structure movement of the water level, pushing the oil and gas ahead to the well bores, as against the inevitable channeling, bypassing; and coning where unrestricted and too rapid withdrawal is practiced.

Utilization of Reservoir Energy

Much progress has been made in the adoption of methods and procedure for the utilization of reservoir energy in the production of oil and gas. Much work has been done along this line in many different fields, with particular reference to the control of pressure which most operators consider to be synonymous with the control of reservoir energy.

The importance of gas in the operation of oil wells has been recognized to such an extent that the approved methods of operating gas wells are being applied more and more to the production of oil wells. Restricted production rates, the use of tubing to produce water or oil by siphoning, and the ensuing conservation of gas are as applicable to oil wells as to gas wells. Practically all wells completed in the last year have been tubed and the production taken through tubing, thereby resulting in steadier operations and lower gas-oil ratios.

Utilization of reservoir energy is at its maximum in wells in Yates, Crane, Winkler, Ward, and Loving Counties and in the Sugarland, Raccoon Bend and Van Fields of Texas. As a general rule in the past, conservation of gas and utilization of gas energy was practiced in partially depleted reservoirs only. Compared with that condition, many wells in flush fields are now flowing with a high tubinghead pressure and utilizing only a small percentage of the gas energy available. Gas energy, water-drive energy and pressure control have thus been taken as one and the same thing, since pressure control is the tool used to utilize reservoir energy in better fashion.

Many of the laws of flowing wells have been applied to pumping wells. Gas-oil ratios have been reduced by closing in casingheads and forcing all fluid, oil or gas, to be produced through tubing. The pumping load is reduced, and savings are made in power and wear and tear of equipment. The daily production has been reduced, as might be expected. But the production curves illustrate the same phenomena as for flowing wells: viz, the decline has been altered and a greater ultimate recovery from the well is indicated. The reservoir energy is being conserved and utilized both in increasing the recovery and in assisting in the production of the oil. Small separators have been erected in the derricks of pumping wells to reduce the flow-line pressure necessary to deliver oil to tanks. This decreased pressure allows additional expansion of the gas in the fluid column which, in turn, utilizes the energy of the gas to the fullest extent.

Control of reservoir energy in a combination gas-and-water-drive pool requires control of water as well as gas. Failure to do so will cause by-passing of water and the loss of recoverable oil. High rates of production in porous zones will increase the rate of water encroachment up-structure in the more porous streaks, thus sealing off oil in the tighter zones. Effective control of water encroachment assumes a uniform level of the approaching water, which can be obtained only by maintenance of pressure at the bottom of the hole.

Bottom-hole pressures taken in West Texas have given data on the drops in pressure from formation to well bore at various rates of production. It is recognized that flow to the well bore is concentric, and varies as the permeability of the formation and the pressure of the contained fluids. The efficient method of recovery will require the depletion of the structure in such fashion that oil and gas will be delivered from the tighter horizons and from the more permeable zones of approximately equivalent rates. This, in turn, makes low rates of production mandatory. The principal steps taken to date in order to utilize the reservoir energy more efficiently are as follows:

Development of indicating and recording instruments for measuring bottom hole pressure; the study of the change in reservoir pressure resultant from unequal withdrawals of oil and gas as between offset wells, leases or local areas; an analytical study of gas-oil ratios, tubing designs, and producing ability of individual wells in local areas; the encroachment of water as a factor in pressure maintenance; and the regulation of total field allowable production.

ZINC CHLORIDE AS TREATING REAGENT

(Continued from Page 30)

been regarded as the characteristic "coal oil" odor. The burning qualities of zinc-chloride-treated kerosene throw doubt on the theories that good kerosene must be low in sulphur content and free from aromatic hydrocarbons.

Zinc Chloride Solution

The continuous stream of zinc-chloride solution which is mixed with the vapors, either in parallel or counter-current according to the type of equipment adopted, must, of course, be voided after its work is done. This may be accomplished either continuously or periodically. In the 5,000-bbl. unit described below, the spent liquid is discharged once per shift. The amount of zinc chloride fed varies from 1 pound to 10 pounds per barrel of distillate being treated. This quantity may be supplied at any desired concentration, provided only that the vapors carry enough sensible heat to evaporate the solution without becoming cooled below the desired reaction temperature. Since we are dealing with a system in which a salt solution is in equilibrium with its vapor pressure, the concentration must adjust itself to the value imposed by that pressure and the temperature. This adjustment takes place with extreme rapidity if the mixing is good enough.

So far as the gasoline itself is concerned, the action of zinc chloride is largely a matter of guess work. Except for the side reactions to be considered in a moment, it can only be described as "catalytic." It seems certain that little or nothing happens to the hydrocarbons, saturated or unsaturated. The high ultimate recovery, and the unchanged octane number of the overhead fraction, permit of no other conclusion; and the amount of polymerization is very small. Some portion, but not all, of the pyridine bases present combines with the reagent to form double salts. The amount of impurities responsible for gum formation and color instability cannot exceed a fraction of 1 per cent; in all likelihood they are aldehydes or other oxygen-containing substances, on which zinc chloride is well known to have a condensing action. This theory is supported by the fact that the higher fractions contain small amounts of highly colored, fluorescent substances.

A small amount of the sulphur reduction shown by the analyses cited is accompanied by the formation of zinc sulphide. This seems to be connected chiefly with the mercaptan reduction. It has been possible to show that mercaptans, as thio-alcohols, react as ordinary alcohols do, to form (thio) ethers:

$$2CH_3SH + ZnCl_2 = CH_3 - S - CH_3 + ZnS + 2HCl \quad (1)$$

There is, however, another process observed with regard to sulphur compounds. This is a sort of polymerization, so that some of the sulphur removal is really brought about by fractionation. Incidentally, so far as these same California stocks are concerned, sulphuric acid acts on sulphur compounds in a precisely similar manner.

When directly connected to a cracking plant giving fixed gases which contain hydrogen sulphide, some of the zinc chloride reacts to form zinc sulphide according to the reversible equation:

$$ZnCl_2 + H_2S = ZnS + 2HCl \quad (2)$$

The amount is not large, and the reaction obeys the mass law; the greater the proportion of hydrogen sulphide in the gases and the higher the pressure, the more zinc sulphide is formed.

Another reaction leading to slight zinc losses is hydrolysis, also reversible reaction:

$$ZnCl_2 + H_2O = Zn(OH)Cl + HCl \quad (3)$$

The hydrolysis increases with temperature, and also with the concentration of the zinc chloride at any constant temperature.

In addition to the chemical reactions just described, there are also mechanical losses due to leakage, etc. Taken all together, the net consumption of zinc chloride in actual practice is from 0.1 to 0.3 pound per barrel treated. The recovery for re-use is a simple matter. The discharged liquor is diluted with water to a strength of 50 to 60 per cent and allowed to settle. A small amount of heavy oil (about 0.5 per cent of the quantity treated) rises to the surface, and is skimmed off as cracking stock. Most of the zinc chloride settles out as a heavy liquor, which is drawn off and used over again, with or without reconcentration according to the feeding system adopted. An intermediate emulsion is washed, preferably with warm water; settled again; and the final emulsion filtered on a continuous filter. The cake contains recoverable zinc as sulphide and hydroxychloride, readily soluble in dilute hydrochloric acid. It is questionable whether such a recovery is profitable except in very large plants; the bulk of the cake is composed of solid and semisolid organic matter of no present known value.

It is clear, from equations (2) and (3), that hydrochloric acid leaves the treating system with the vapors. The concentration is small, and the vapors are "dry" until the condensing system is reached. No corrosion due to this source has yet been observed, except in the condensers. Here it is combated in the same manner as is customary with corrosive crudes containing magnesium chloride, by injecting weak sodium-hydroxide solution,

or ammonia solution or gas, into the condenser lines as they leave the fractionating towers. A new, semiautomatic method of controlling vapor acidity has been in use for nearly a year, but is not yet ready for description.

The treater itself is built of steel shell, protected against corrosion by zinc chloride, when hot and in active motion, by suitable lining. Lead and copper linings are resistant, but usually too soft, so that they cut away. Acid-proof bronze stands up well; the high-silican irons are highly satisfactory against chemical action, but their brittleness is a drawback. Perhaps the most reliable lining is acid-proof stoneware, which has been employed as bricks as well as in shapes such as pipes, etc. Porcelain is much thinner and lighter, but very much more expensive. Storage tanks for zinc-chloride solutions, both cold and as hot sludge, built of ordinary steel plate, have been in service for several years without developing leaks.

Chlorine Content

It is clear from the quantity of zinc chloride consumed per barrel of gasoline treated that no appreciable amount of chlorine can have passed into the gasoline, even if all the chlorine in the zinc chloride had been transferred in that manner. Moreover, there is a close quantitative relationship between the amount of hydrochloric acid which can be measured in the exit vapors and which is neutralized there in the customary manner by means of alkalies, and the amount of zinc chloride consumed.

Direct experiment has confirmed the conclusion that chlorine is not present in the treated gasoline in measurable quantities. A sample of 2.0 grams was burned in the ordinary sulphur lamp, and the absorption liquid tested for chlorine by the nephelometer. The difference between the amount found and the quantity in a blank test of the reagent employed was too small to be estimated. In a further test 100 cc. gasoline was heated for several hours with 1 gram metallic sodium wire; when taken up in water the alkaline solution was entirely free from chloride iron.

Compared to Other Processes

Since present-day refining difficulties are connected chiefly with the marketing of cracked gasoline, and since the sulphuric acid and the contact catalysis treatments are the methods in major use, the following brief tabulation will be confined to this single raw material and the comparison of zinc chloride refining with the two processes named.

Sludge losses: Sulphuric acid is used in amounts ranging from 5 to 10 pounds per barrel. Sludge losses increase with the amount of acid, its strength, the time of contact and the temperature. Few plants operate with a loss lower than 3 per cent due chiefly to solvent action of the acid (Potthoff[4]). Acid recovery is expensive, and has a considerable nuisance element to contend with. There are no sludge losses with either clay contact or with zinc chloride treatment.

Polymerization: In the refining industry, this term refers to the conversion of hydrocarbons lying within the gasoline boiling range into products of higher boiling point, which are, therefore, eliminated during redistillation. The mechanism of polymerization is not well understood. Economically, however, it is a reversal of the cracking operation. High boiling hydrocarbons are cracked in order to lower their boiling points, and thus increase their sales value. To the extent that polymerization takes place, this enhanced sales value is lost, and good money has been spent (in cracking and treating) merely to recover raw material With sulphuric acid treatment, polymerization losses are quite large (see Rue and Espach, p. 45-50[5]) and may reach 20 per cent.

Polymerization with either zinc chloride or clay catalysis is less than 1 per cent.

Redistillation: This operation is always necessary after sulphuric acid treatment. Both of the other treating processes are able to dispense with rerunning, although in both cases it may be desirable for economic reasons.

Sulphur reduction: This is still an unsolved problem with all treating processes, and selection of raw stocks low in this element seems to be the best procedure. Sulphuric acid, used in large amounts, is the most successful reagent, but a heavy penalty (in sludge and polymerization losses, as well as in acid recovery) is exacted. Zinc chloride will, on the average, reduce the sulphur content to the extent of 25 to 40 per cent. Clay contact has little or no action on sulphur elimination.

Gum reduction: Sulphuric acid treatment will reduce gums to any desired extent, if enough acid is used. Zinc chloride in routine operation brings gums to the vanishing point. Clay contact varies considerably in its effect; on some stocks it works admirably. On others, the time of contact must be doubled or trebled; on distillates such as California produces it seems to be quite ineffectual.

Color stability: What has just been said about gum reduction applies almost exactly to color stability. Sulphuric acid will achieve it, if the price is paid. Zinc chloride always gives color-stable products. Clay contact may or may not do so, and sometimes cannot.

Knock rating: Sulphuric acid almost invariably reduces the octane number. Both clay contact and zinc chloride treatment conserve the octane number unchanged.

Applicability: Sulphuric acid is a universal treating agent. Zinc chloride will also treat all classes of stocks. Clay contact seems to be restricted to selected raw materials.

Cost of operation: Cost accounting is a mysterious art, and it is almost impossible to compare costs as published by one operator with those given by another, especially if and when the treating systems in the two cases are not identical. We have, however, cost figures for one and the same plant, treating the same stock, by sulphuric acid on the one hand and by zinc chloride on the other. These figures are given in this paper.

No comparative figures are available for operation costs of clay contact systems. They are much lower than the cost of sulphuric acid treatment, and in some instances seem to be less than the cost of refining with zinc chloride.

Indirect figures, such as plant overhead, etc., have been omitted in the tables, as well as interest and depreciation on the treater itself. The cost of the zinc chloride is so small that it may be completely wiped out in a month or two.

COMPARATIVE COSTS OF REDISTILLATION SULPHURIC ACID AND ZINC CHLORIDE TREATMENTS ON THE SAME RAW STOCK, PER BARREL TREATED

Item—	Zinc chloride	Sulphuric acid
Labor	$0.0096	$0.0212
Fuel	0.0100	0.0168
Water	0.0048	0.0050
Steam	0.0120	0.0122
Electricity	0.0002	0.0054
Zinc chloride	0.0158	.....
Sulphuric acid	.....	0.0442
Caustic soda	.....	0.0323
Ammonia	0.0018	..
Repairs	0.0040	0.0108
Cost per barrel treated	$0.0582	$0.1479

The above figures do not take cognizance of sludge and polymerization losses, the values of which differ with location and with market prices. The cost of sweetening, which also rises considerably with the type of equipment used, is not included. In the plant described, it is $0.001 per barrel. The gasoline item is figured at $2.10 per barrel, recovered cracking stock at $0.90 per barrel.

NET VALUES PER BARREL OF PRESSURE DISTILLATE TREATED, WITH ADJUSTMENT FOR POLYMERIZATION AND LOSSES

	%	Zinc chloride	%	Sulphuric acid
Gasoline recovered	90	$1.8900	73	$1.5330
Gas oil recovered	9.75	0.0428	23.25	0.2093
Loss	0.25	.....	3.75	.....
Gross value of products		1.9328		1.7423
Less refining cost		0.0582		0.1479
Net value of products		$1.8746		$1.5944
Saving due to zinc chloride treatment				$0.2802

This tabulation gives only the direct monetary saving in the refinery. The saving increases with the difference in value between refined gasoline and cracking stock. The average loss of octane rating due to sulphuric acid treatment was four points. Color stability of the acid refined stock was poor, shipments arriving at Bayonne 16 to 18 color instead of 30 as at present. Cash adjustments on deliveries were not infrequent, and always expensive.

Construction Problems

The construction of a zinc chloride vapor-phase gasoline treater offers no serious difficulties. In practically every case, existing equipment can be utilized to the fullest extent. There are three general types of construction corresponding to the three possible modes of operation which will be briefly enumerated here.

Type 1—Direct Treatment

In this method, which is suitable for cracking plants directly producing endpoint gasoline and operating no more than two or possibly three such cracking units, the treating equipment is merely inserted between the fractionating tower and the condenser of each cracking plant. It has already been pointed out that the volume occupied by the treater itself is quite small.

Type 2—Redistillation of Blended Endpoint Stocks

This mode of operation is best adapted to larger plants having a number of cracking units producing endpoint gasoline which, however, may vary slightly in composition from unit to unit. The raw pressure distillates so obtained are blended together and treated in larger vapor-phase zinc chloride units by the method of redistillation. The flow sheet given in Figure 2 shows the schematic arrangement. The 5,000-bbl. unit, whose operating results have been described above, and which is shown in the photographs, Figures 3, 4 and 5, operates according to this scheme. It consists primarily of a remodeled crude still battery. This battery was originally composed of four pipe heaters, three shell stills, four flash evaporating towers and four fractionating towers, each with its own condenser. In order to adapt it to treating purposes, the four pipe heaters were manifolded into a single vapor line, going to the treater itself. The shell stills were disconnected entirely, and are used for storage of zinc chloride solution. The four flash evaporators were also disconnected, one being used as a sludge reservoir from which zinc chloride is discharged three times daily, and a second one for the semiautomatic control of vapor acidity which has been briefly referred to. The vapors after leaving this last tower come to a second manifold, from which they are distributed by means of hand-operated valves to the four fractionating towers. These fractionating towers have varying capacities; and the vapors are, therefore, distributed to them so that each functions to best advantage. By cutting out one or more heaters and one or more fractionating towers, it is possible to operate the treater at a reduced rate. There is, of course, no real need for this multiplicity of heaters and fractionating towers, but it will be seen that almost any type of available equipment can be utilized to advantage.

Type 3—Redistillation of Pressure Distillate Requiring Separate Fractionation

This mode of treatment applies to distillates coming from cracking plants in which the final control of endpoint is made a separate operation; for example, many Dubbs plants function in this manner. The arrangement is similar to Fig-

CALIFORNIA CRUDE OIL PRICES

(Continued from Page 125)

ASSOCIATED OIL CO. PRICES

Associated Oil Co. prices, effective June 20, are as follows:

Ventura Avenue, 22 gravity, 55 cents, with 2 cents added for each degree upward to and including 30 gravity, which is 74 cents.

Kettleman Hills, 30 gravity and above 66 cents.

Potrero, 34 gravity, 69 cents, with 2 cents added for each degree upward to 34 gravity, which is 69 cents.

UNION OIL CO. OF CALIFORNIA

Crude Oil Prices for Its Purchases at the Well for Crude Produced in Strict Accordance With the Production Allocations Made by the California Statewide Curtailment Committee Effective 7 a.m., June 20, 1931

(All gravities above those quoted take highest price for that field)

Gravity °A.P.I.		Signal Hill	Alamitos Heights, Seal Beach	Huntington Beach	Athens, Rosecrans, Dominguez	Torrance	Santa Fe Springs	Playa Del Rey*	E. Coyote, Richfield	Montebello	Santa Paula	Orcutt	Coalinga	Lost Hills	McKittrick, Kern River, Sunset-Midway, Elk Hills, Buena Vista Hills	Gravity °A.P.I.
11-13.9	.....	....	....	....	....	....	....	....	....	....	....	....	....	....	$.50	11-13.9
14-14.9	.....	$.65	$.65	$.65	....	.65	....	....	$.65	$.65	$.65	$.55	$.55	$.55	.55	14-14.9
15-15.9	.....	.65	.65	.65	....	.65	....	....	.65	.65	.65	.55	.55	.55	.55	15-15.9
16-16.9	.....	.65	.65	.65	....	.65	....	....	.65	.65	.65	.55	.55	.55	.55	16-16.9
17-17.9	.....	.65	.65	.65	....	.65	....	....	.65	.65	.65	.55	.55	.55	.55	17-17.9
18-18.9	.....	.65	.65	.65	....	.65	....	....	.65	.65	.65	.55	.55	.55	.55	18-18.9
19-19.9	.....	.65	.65	.65	....	.65	....	$.65	.65	.65	.65	.55	.55	.55	.55	19-19.9
20-20.9	.....	.65	.65	.65	....	.65	....	.65	.65	.65	.65	.56	.55	.55	.55	20-20.9
21-21.9	.....	.65	.65	.65	....	.65	....	.66	.66	.65	.65	.57	.55	.57	.55	21-21.9
22-22.9	.....	.65	.65	.65	....	.66	....	.67	.67	.65	.65	.59	.55	.59	.56	22-22.9
23-23.9	.....	.67	.67	.67	....	.67	....	.68	.68	.65	.65	.61	.55	.60	.58	23-23.9
24-24.9	.....	.69	.69	.69	$.69	.68	$.65	.69	.69	.65	.66	.63	.56	.62	.61	24-24.9
25-25.9	.....	.71	.71	.71	.71	.70	.65	.70	.70	.65	.68	.65	.57	.64	.64	25-25.9
26-26.9	.....	.73	.73	.73	.73	....	.65	....	.72	....	.70	.67	....	.66	.66	26-26.9
27-27.9	.....	.75	.75	.75	.75	....	.68	....	.74	....	.72	....	....	.67	.68	27-27.9
28-28.9	.....	.77	....	....	.77	....	.71	....	....	....	.74	....	....	.69	.71	28-28.9
29-29.9	.....	.79	....	....	.79	....	.73	....	....	....	.76	....	....	.71	.74	29-29.9
30-30.9	.....	.81	....	....	.81	....	.75	....	....	....	.78	....	....	.73	.76	30-30.9
31-31.9	.....	....	....	....	.83	....	.78	....	....	....	....	....	....	....	....	31-31.9
32-32.9	.....	....	....	....	.85	....	.80	....	....	....	....	....	....	....	....	32-32.9
33-33.9	.....	....	....	....	.87	....	.83	....	....	....	....	....	....	....	....	33-33.9
34-34.9	.....	....	....	....	.89	....	.86	....	....	....	....	....	....	....	....	34-34.9

*Subject to a gathering charge of 5 cents per barrel.

ure 1, except that a fractionating tower is located between the heaters and the treating towers; the bubble tower at the right can be made much smaller in this case. If the temperature of the vapors leaving the first fractionating tower is too low, it can be raised by operating the tower as well as the treater under a sufficient increase of pressure.

Conclusion

The method of refining gasoline which has been described in the preceding pages is a radical departure from previous practice in this industry. It combines the ability of sulphuric acid to treat all types of raw stock with the low cost speedy purification which clay catalysis is able to impart to a limited class of pressure distillates. It enables the refiner to market a cracked gasoline practically free from gums, with the assurance that it will not go off color during storage or transportation. It may be said safely that this process is past the experimental stage; the laboratory and pilot plant work covered a period of more than two years. A commercial unit with a capacity of handling from 1,000 to 1,200 bbls. per day was in service for nearly two years more, during which time it was used for all three modes of operation: Directly connected to a cracking plant, as a redistillation treatment, and for the treatment of heavy distillates of the Dubbs type. The 5,000-bbl. unit just described has been in practically continuous operation for six months. The installation of several other units, in various parts of the United States, is now under consideration.

Bibliography

[2]"Refining of Light Petroleum Distillates," H. P. Rue and R. H. Espach, Bureau of Mines Bulletin No. 333.

[3]Arthur Lachman, U. S. Patent 1,790,622 (January 27, 1931); U. S. Patent 1,809,170 (June 9, 1931); U. S. Patents 1,826,138-47 (October 6, 1931); other patents pending and many foreign patents allowed or pending.

[4]"Purification of Pressure Distillates," E. H. Potthoff, The Oil and Gas Journal, 29, No. 42, 141 (1931).

CHANGES IN PRODUCTION OF NATURAL GASOLINE

(Continued from Page 122)

California, which ranked third in 1929, fell to eighth. Gray County, in the Panhandle of Texas, more than doubled its output in 1930 and rose to third from eighth in 1929. Other important producing counties were Hutchinson, Texas, Creek and Osage, Oklahoma, Fresno and Kings, California.

Disposal of Output

Of the total output of natural gasoline in 1930—2,210,494,000 gallons—1,743,042,000 gallons, or 78.9 per cent, was blended at refineries; 70,098,000 gallons, or 3.2 per cent, was run through pipe lines in California; 10,621,000 gallons, or .5 per cent, was blended at plants east of California; 232,890,000 gallons, or 10.5 per cent, was estimated as exported and sold to jobbers; 3,658,000 gallons, or .1 per cent, was added to stocks, leaving a balance of 150,185,000 gallons, or 6.8 per cent, for losses, quantities not accounted for, and for the relatively small amounts run through pipe lines east of California and blended at plants in California. Similar data for 1929 are not available for all the items, but the most important change in 1930 was a gain in the relative importance of the total exported and sold to jobbers.

The refineries, the largest consumers of natural gasoline, used a total of 1,743,042,000 gallons of natural gasoline in blending in 1930, in addition to 88,028,000 gallons which was turned into pipe lines and eventually run to stills with crude or other oils, making a total utilization of 1,831,070,000 gallons. The year witnessed a decline in blending of natural gasoline at the refineries along the Atlantic seaboard which, together with a probable gain in shipments of natural gasoline from California to that district, deprived the Mid-Continent producers of a portion of their market and forced them to dispose of more locally or to plants in contiguous districts. Thus the amounts of natural gasoline blended in Kansas, Oklahoma and Texas showed a material increase in 1930, although the total output of these three states registered a small decrease. On the basis of the percentage of natural gasoline utilized to the total output of motor fuel, the California district easily ranks first, the East Coast district is last. The fact that the East Coast ranks first and California last in the percentage of motor fuel output that is produced by the cracking process illustrates the close relationship between the expansion of cracking and the blending of natural gasoline .

Pipe Line Transportation

The transportation of natural gasoline to refineries by pipe lines apparently declined in 1930 since the amount transported fell to 88,028,000 gallons from 113,534,000 gallons in 1929. However, there is a possibility that this decrease may be more theoretical than actual since it is the practice of some companies to report natural gasoline utilized as "natural gasoline blended," regardless of whether it came to them by pipe line or tank car. California, where 70,098,000 gallons of natural gasoline was handled in pipe lines in 1930, continued to rank first in this type of transportation. The quantity transported in lines east of California increased in 1930 but the total, 17,930,000 gallons, was only equivalent to about 1 per cent of the amount distributed.

The construction of new lines to transport natural gasoline was virtually at a standstill in 1930. No long lines were constructed, the only work entailing the construction of short lines from the plants to refineries or loading racks.

The practice followed by some manufacturers of buying naphtha from refiners to blend with raw natural gasoline in the production of finished motor fuel suffered a drastic decline in 1930, after remaining practically unchanged during 1928 and 1929. The quantity of natural gasoline used in motor blends at natural gasoline plants fell from 27,569,000 gallons in 1929 to 10,621,000 gallons in 1930; the amount of naphtha blended in 1930 amounted to 11,748,000 gallons, or hardly more than one-third of the 1929 total.

Although complete figures are not available, it is believed that there was a material growth in exports of natural gasoline in 1930. Figures of exports of natural gasoline are available only for California. These show total shipments to foreign countries in 1930 of 106.848,000 gallons or the equivalent of 13 per cent of the production in that state. Although some of the exports from California are consigned to Pacific ports, the major portion travels to foreign countries bordering on the Atlantic via the Panama Canal and is thus brought into direct competition with natural and refined gasoline produced east of the Rockies.

Stock Situation

Stocks of natural gasoline held at the plants on December 31, 1930, amounted to 24,316,000 gallons as compared with 25,362,000 gallons on hand at the beginning of the year. Stocks of natural gasoline held by refiners, which data were made available in 1930 for the first time, amounted to 75,558,000 gallons at the close of the year, a decline of nearly 5,000,000 gallons from the previous year. Total stocks at the close of 1930 amounted to 99,874,000 gallons, or approximately 17 days' supply.

As stated above, the practice of blending natural gasoline with purchased naphtha at the plants has declined; consequently, the quantity of motor blends held by the operators has shown a tendency to decrease. Stocks of blends held at the plants on December 31, 1930, totaled 485,000 gallons, as compared with 676,000 gallons on hand at the end of the previous year and with 1,224,000 gallons stored on December 31, 1928.

Value Declines

The natural gasoline produced in 1930 had a total value at the plants of $128,160,000, a decline from the previous year of $30,250,000, or 19 per cent. The average value per gallon in 1930 was 5.8 cents as compared with an average of 7.1 cents in 1929. The 1930 average represents the lowest value ever recorded since natural gasoline statistics were first compiled (1911) and is but a fraction of the record value of 18.7 cents per gallon recorded in 1920. The average posted price of Grade A natural gasoline in Oklahoma in 1930 was 5.4 cents per gallon. The difference of .4 cent per gallon in favor of the average value as compared with the average posted price was due mainly to the fact that the posted price, which covers only one grade in Oklahoma, did not reflect the higher averages which prevailed in California, the leading producing state. To a lesser extent the difference was due to the fact that some manufacturers made long-term contracts early in 1930 which, because of the late season decline in prices, turned out to be advantageous.

The record of spot prices for natural gasoline in 1930 indicates a material weakening in quotations over the year. The price for Grade A natural gasoline in Oklahoma on January 1, 1930, was 6.25 cents per gallon, but at the end of the year this had fallen to 3.5 cents per gallon, the lowest price ever recorded. The price trend in 1930 was characterized by a number of fluctuations; for example, the price in May was higher than at the beginning of the year and the price on October 1 was but slightly below the quotation of January 1. These temporary stiffenings in price quotations of natural gasoline in 1930 were undoubtedly reflections of the decline in production.

Prior to 1930, the trends in the production of natural gas and natural gasoline were very similar, with the output of natural gasoline registering the larger annual increases owing to the growth in percentage recovery. In 1930, however, the output of natural gas rose to a new high record, but the output of natural gasoline registered its first annual decline since statistics were first compiled in 1911.

The total output of natural gas in 1930 totaled 1,943,421,000,000 feet, an increase of 1.3 per cent over 1929. Exports to Canada and Mexico amounted to 1,798,000 feet; imports from Canada, the first in recent years, totaled 21,000,000 feet, giving 1,941,644,000,000 feet as the total consumption of natural gas within the United States in 1930. The quantity of natural gas treated for the recovery of natural gasoline in 1930 totaled 2,088,788,000,000 feet, an equivalent of 107 per cent of the production. This marks the second successive year in which the amount of gas treated has exceeded the amount produced. The excess was again due to the fact that in some states, particularly California and Texas, large quantities of gas were treated, but the residue gas, for the want of a market, was allowed to escape into the air.

GASOLINE MARKET CONTINUES ADVANCE

(Continued from Page 20)

of the country to discuss conditions usually results in either a bullish or bearish attitude which has direct importance in determining the market position of individual companies over the balance of the year and the first part of the following year.

Gasoline and Naphtha

A majority of refiners on Monday and Tuesday in Oklahoma were quoting U. S. Motor gasoline over a price range of 4½ to 5 cents. The highest prices were for the branded grades of better than average octane rating. Small quantities of resale material were offered as low as 4¼ cents. Some of this gasoline did not meet all the latest specifications for U. S. Motor gasoline and the octane rating is low. The supply was coming largely from two small plants which recently started operating in the Oklahoma City Field.

The 400 endpoint grade was bringing little more than the U. S. Motor grade, the bulk of the sales being made at a price range of 4⅝ to 4¾ cents except when some special octane rating was assured. The 375 endpoint grade was quoted at a low of 5⅛ cents and 350 and 360 endpoint grades, 5¼. The higher gravity grades are more freely offered than they were earlier in the month.

Few sales of blending naphthas are reported. Sellers generally are following the U. S. Motor prices in their naphtha quotations.

Kerosene

There was a spurt in kerosene purchases the latter part of last week which carried over into this week. There were at least two inquiries in the market from export buyers and a few orders were placed both in Oklahoma and North Texas. Some of the options secured last week by buyers were not exercised and more kerosene was available the first of the week. The advance to 2⅛ cents for 41-43 water white kerosene was maintained. Several refiners who have been quoting 2⅛ cents advanced to 2¼ cents. The 42 and higher gravity grades were quoted at a low of 2¼ cents.

Furnace Oils

Buyers and sellers agree that the market on all grades of furnace oils is not as tight as it was in late October. Prices have not receded but several grades are more freely offered. However, certain grades continue to be scarce and are practically unobtainable on the spot market. Last week's quotations for the high gravity fuels and the regular grades of furnace oil continue unchanged.

Enough high cold test gas oil is being offered so that sales were made during the past week as low as 1¼ cents. This material is coming from plants in the Oklahoma City Field. The products have a cold test of 60 or higher.

Sellers are confident that the lull in furnace oil material is temporary. Jobbers bought heavily the latter part of October and the warm weather in the consuming areas has tended to reduce consumption. It is believed that buying will be active again with the first cold period of the year.

Natural Gasoline

Natural gasolines were steady on Monday and Tuesday. Grade A was firm at 4¾ cents in Oklahoma with several refiners quoting the same prices for Grade AA and Grade BB. The low on grades other than AA was 4½ cents. Texas prices were one-fourth cent lower. There is still considerable business to be placed for the last half of the month.

Other Products

The industrial grades of fuel oils were unchanged. No special activity in cylinder stocks and wax was reported but no important sales with price concessions are reported.

Late Fields

(Continued from Page 32)

tering two bailers of live oil at 3,835-40 feet it is now drilling ahead.

EAST TEXAS

FORT WORTH, Tex., Nov. 10.—Cranfill & Reynolds' No. 1 Rasb in the Eubanks survey, Upshur County, East Texas, cored 3,595 to 3,615 feet, but recovered all shale. They will drill deeper, but test is now generally regarded as dry and that it conclusively defines the Lathrop area.

COLORADO

The important test of the Reiter-Foster Corp. No. 1 Johnson-Juhl, a half mile west of production on the Greasewood dome in Colorado, was reported late Saturday to have uncovered salt water at 6,703 feet.

OKLAHOMA

If the Arbuckle lime horizon in the Oklahoma City Field is depleted by January 1, 1932, a new proration order will be issued and the allowable production in the field increased. Many express the opinion that all the recoverable oil will be taken from the Arbuckle lime area in the two or three months. The Oklahoma Corporation Commission Monday issued an order permitting the swabbing or bailing of "dead" wells—wells that will not flow prior to taking potential tests. Due, it is believed, to the long shutdown during martial law some of these wells when opened refused to flow their production

for potential tests. The swabbing and bailing will permit a fair test.

Another order by the Corporation Commission provided that reports on production be filed with the umpire's office within 24 hours after the 7 a. m. shut-off, each day. Failure to make such reports may cause the operator to be penalized by shutting down the wells until reports have been made to the umpire.

The commission also classified four Indian Territory Illuminating Oil Co. wells as gas wells. They are: No. 1 Fee, C SE SE, Section 24-11-3w, the discovery well in the field, which yielded 1,046,000 bbls. of oil before it was plugged back to the upper gas horizon; No. 3 Sonora Bodine, No. 7 Alice Bodine and No. 3 Bodine-Anderson. All of these wells are in the Silicious lime area of the field and in the vicinity of the discovery well.

In Marshall County, Dixon and others' No. 1 McDuffie, SE cor. NE SW, Section 3-7s-6, was drilled a total depth of 1,105 feet, which is deep for that area, and then plugged back to a sand at 1,065-68 feet which tested dry, and was plugged back again to 828 feet to test a sand found at 790 feet from which oil rose 150 feet in the hole in 36 hours. Taliaferro and others' No. 1 Fee, SE cor. NW, Section 34-5s-5, was landing the casing at 580 feet. The test found a showing of gas at 305-75 feet. Everett and others' No. 1 Ayres, SE cor. NE, Section 14-7s-6, found water at 576-93 feet and was drilling at 760 feet. Neff and others' No. 5 West Ruthland Trust Co., NW cor. SE, Section 30-5s-6, was spudding.

The deepest well in the Mid-Continent area is cleaning out and it will be drilled deeper. Mid-Kansas Oil & Gas Co. and Ramsey Petroleum Corp.'s No. 6 Preston-Culp, NW cor. NE, Section 6-5-9w, in the Cement Field in Caddo County, was cleaning out after landing 9,777 feet of special 6-inch casing. The total depth of the hole is 10,079½ feet.

KANSAS

In the Goodrich Pool, in Sedgwick County, Kansas, Continental Oil Co. has two semiwildcat tests drilling. If these tests find production they will extend the producing area in the pool. The No. 1 S. Black, in Section 16-25-1, was drilling below 1,000 feet, and No. 1 W. Casey was drilling below 800 feet. Both will be drilled to the Viola lime horizon.

Another wildcat in Sedgwick County was nearing the pay horizon. A. M. Scrogging and others' No. 1 Ross, in Section 4-28-1, was drilling at 2,750 feet, on the last report.

In the Eastborough Pool, Sedgwick County, Magnolia Petroleum Co.'s No. 2 Vickers, NW cor. SW SW, Section 17-27-2, is a rig. Fisher & Lauck's No. 9 Wheeler, NE cor. SW SE, Section 19-27-2, was drilling at 1,700 feet.

The wildcat test, Derby Oil Co. and Aladdin Petroleum Co.'s No. 1 Stoltenberg, Section 22-16-10w, was drilling below 3,050 feet, expecting to reach the pay horizon in a few days. The test has been drilling about 30 days.

In the Ritz-Canton Pool, the Darby Petroleum Corp.'s No. 4 Kaegi, SE cor. NE NE, Section 20-19-1w, in the northeast edge of the field, was drilling at 2,700 feet. It will test the deep horizon in the area adjacent to the townsite of Canton where large gas wells have been found in the chat formation.

TEXANS ORGANIZE TO CONSERVE THEIR OIL AND GAS RESOURCES

By L. E. Bredberg
Fort Worth Bureau, The Oil and Gas Journal

FORT WORTH, Tex., Nov. 6.—The Texas Oil and Gas Conservation Association, consisting of company representatives and independents alike, perfected a permanent organization here today, electing Charles F. Roeser of the firm of Roeser & Pendleton, Inc., Fort Worth, as president, naming 26 men as vice presidents to represent various widely scattered districts in the State, and appointing 110 directors who are either independent operators in one or more fields in the State of Texas, are representatives of small companies operating in the State, or representatives of major oil companies. It is an organization composed of all men who are interested in the oil industry, whether or not they are directly interested in the producing, pipe line, refining or marketing of crude oil. The group is striving to enlarge the association to as many members as possible, the membership fee being only $1 in order to attract many who would feel indisposed to join if the membership was higher. At the present time there are over 1,800 members signed up in the organization.

J. D. Collett, who was elected first vice president, empowered to act in the absence of Mr. Roeser, was chairman of the meeting.

Mr. Roeser, the founder of the organization, was the principal speaker, citing the need of such an organization in the oil industry of the State of Texas to control the vast new field in East Texas, and other fields which might be discovered later. "Control," said Mr. Roeser, "must come through conservation, which is to obtain the greatest yield per acre at the lowest cost. There has been an overproduction of oil since the advent of the Yates Pool in 1926, and the old law of supply and demand seems in error. Conservation is important to the 30,000 stripper wells in Texas, which should be preserved. It is possible to preserve them only by conservation."

Mr. Roeser made it clear that the association is not to take sides on any form of proration, having other important work to transact in the conservation problems confronting the operators in the State.

Confidence in Sterling

Col. J. Lewis Thompson, a colorful figure in East Texas, and former president of the East Texas Home and Land Owners Association which was merged into this new association, stated that the forests of his part of the State had been ravaged, much good timber having been burned and wasted when timber was in greater demand than it is at present, and emphatically stated that the people did not want their oil wasted in the same manner. He expressed himself as highly in favor of Governor Sterling's conservation ideas, and felt sure that he would do what was best for the industry, and the people of his section of the State.

Freeman Burford also expressed himself as being in favor of whatever action the governor took in the way of curtailing drilling and production in East Texas, Charles Roeser joining Mr. Burford in this, stated that he was in favor of any modified plan of proration which might be put into effect by the governor, "a man who knows the industry of East Texas and will know best how to meet the situation."

The following wire was sent to Governor Sterling commending him for what he had done in carrying out conservation work in Texas: "At a meeting today in Fort Worth, at which permanent organization of Texas Oil and Gas Conservation Association was effected, with membership of 1,800, resolution was unanimously adopted commending you upon your courageous action in connection with the conservation of the natural resources of this State." Signed W. B. Hamilton, E. H. Eddleman and J. D. Collett, resolutions committee.

Mr. Roeser and the temporary organization formerly appointed to work on planning the association were tendered a vote of thanks and commendation for the work they had done in behalf of the association.

Center on East Texas

Work of the association will be centered upon East Texas. Many unnecessary wells have been drilled, and it is hoped that others now planned may be held up until needed.

In order to stimulate the functioning of the association and to bring each appointed director to realise his part in the affairs of the group, the president will write to each director, those not answering being dropped from the list of directors as unable or unwilling to serve.

J. C. Foster, Fort Worth; Col. J. Lewis Thompson, Longview; P. B. Flynn, Reno Oil Co.; R. H. Morrison, the California Co., and Clifford Mooers, the Shasta Oil Co., prepared the list of directors for nomination.

President Roeser will appoint an executive committee of nine men from the list of vice presidents and directors, which will be in charge and draw up by-laws and rules and regulations for the association.

Vice Presidents and Directors

Vice presidents appointed were: Wilbur C. Hawk, Amarillo; George Morgan, San Angelo; Joe Edwards, Big Spring; P. B. Flynn, Wichita Falls; Frank Zoch, San Antonio; George Sawtelle, Houston; Beeman Strong, Beaumont; E. A. Landreth, Fort Worth; W. L. Todd, Dallas; J. K. Hughes, Mexia; Clifford Mooers, Longview; H. L. Hunt, Tyler; J. Malcolm Crim, Kilgore; R. L. Moore, Vernon; D. W. Bolin, Graham; John Alford, Henderson; Marshall R. Young, Breckenridge; Jake Hamon, Gladewater; John Gholson, Ranger; R. L. Wheelock, Corsicana; R. A. Motley, Overton; C. H. Sherman, Abilene. J. D. Collett was elected first vice president, empowered to act in President Roeser's absence. Col. J. Lewis Thompson, Dr. N. D. Buie, president, East Texas Chamber of Commerce, and Capt. J. F. Lucey, Dallas, were appointed vice presidents at large.

The following are the directors of the association: Earle Calloway, Tyler; R. W. Fair, Tyler; J. C. Nicholson, Longview; J. C. Collins, Corsicana; J. K. Hughes, Mexia; Marvin Kelley, Longview; Bill Johnson, Tyler; Frank LeFever, San Antonio; K. M. Reagan, Pecos; Joseph Edwards, Big Spring; M. E. Daniels, Breckenridge; John F. O'Donohoe, Wichita Falls; J. S. Bridwell, Wichita Falls; Capt. J. F. Lucey, Dallas; Rade Kangerga, Henderson; E. B. McFarland, Tulsa; Bill Morgan, Houston; E. Rubsamen, San Antonio; Gus Blankenship, Jacksonville; W. F. Scarbrough, Midland; W. Charlton Griffith, Terrell; B. L. LeFever, Big Spring; W. B. Hamilton, Wichita Falls; Faulk, Longview News, Longview; Guy Bount, Nacogdoches; Clyde Bennett, Houston; Frank Foster, Tyler; E. T. Moore, Dallas; D. H. Byrd, Dallas; S. P. Farish, Houston; George H. McIntyre, Fort Worth; R. H. Morrison, Dallas; H. E. Marsh, Fort Worth; T. F. Hunter, Wichita Falls; Edwin B. Hopkins, Dallas; Prentiss Brown, Midland; L. E. Barrows, Fort Worth; R. A. Motley, Overton; J. D. Collett, Fort Worth; J. P. Shannon, Fort Worth; M. W. Blair, Wichita Falls; J. Malcolm Crim, Kilgore; Frank Zoch, San Antonio; W. C. Windsor, Tyler; W. O. Alford, Overton; Roy Jenkins, Dallas; H. R. Stroube, Corsicana; C. A. Loftus, Longview; Dr. A. S. Jarvis, Troup; George Parker, Tulsa; Beeman Strong, Beaumont; M. G. Cheney, Coleman; R. L. Moore, Vernon; H. H. Weinert, Seguin; C. B. Long, Wichita Falls; P. B. Flynn, Wichita Falls; John Alford, Henderson; W. D. Tucker, Tyler; W. R. Nicholson, Longview; Miles Speers, Tyler; Dilworth S. Hager, San Antonio; Ike S. Kampmann, San Antonio; William Fleming, Fort Worth; Joseph Crump, Midland; D. W. Bolin, Graham; Joe M. Weaver, Eastland; Marshall Young, Breckenridge; E. H. Eddleman, Wichita Falls; Roy Laird, Kilgore; Fred Sealey, Houston; Jack Herbert, Fort Worth; E. G. Allen, Dallas; H. A. Eklund, Tyler; C. E. Yager, Fort Worth; J. G. Pew, Dallas; R. H. Flynn, Amarillo; W. F. Morgan, San Antonio; G. A. McCreight, Longview; Clifford Mooers, Longview; F. K. Lathrop, Longview; Benny Cox, Bartlesville; Bob Hargrove, Houston; James C. Foster, Jr., Fort Worth; J. R. Pearson, Corsicana; Col. J. Lewis Thompson, Kilgore; Fred Stuckey, Longview; Dr. F. L. Thomson, San Antonio; Al Buchanan, San Antonio; W. L. Todd, Dallas; Jake Hamon, Longview; R. L. Wheelock, Corsicana; John Gholson, Ranger; George Morgan, San Angelo; Robert R. Penn, Dallas; Marrs McLean, Beaumont; S. A. Guiberson, Jr., Dallas; R. E. Hardwicke, Fort Worth; H. R. Dickerson, Shreveport; Charles F. Roeser, Fort Worth; E. L. Smith, Mexia; W. E. McKinney, Tyler; H. L. Hunt, Tyler; Ed. Mayer, Amarillo; E. A. Landreth, Fort Worth; Mr. Sherman, Abilene; George Sawtelle, Houston; Harry Reynolds, Houston; F. W. Burford, Dallas.

WESTERN SERVICE CORP IN GAS CONSOLIDATION

CHICAGO, Nov. 9.—Consolidation of a group of Oklahoma gas properties, including the Pioneer Gas Utilities Co., Kingfisher Gas Co., Oklahoma General Utilities Co., and the gas properties of the Western Service Corp. in Oklahoma, into a new operating company to be known as the Western Service Co. of Oklahoma, is announced. T. F. Murchison, head of the Chicago investment banking house of Peabody & Co., will be president of the new company. Earl R. Ernsberger, now president of the Western Service Corp., will be chairman of the new company's board.

During its separate existence the Western Service Corp. won franchises at Guthrie, Shawnee, Britton and was a rival to replace the Oklahoma Natural Gas Corp. in Oklahoma City.

CRUDE PRICE CHANGES

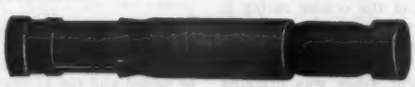
(Continued from Page 126)

barrel, making the new price 75 cents per barrel.

Effective November 9 the Joseph Seep Purchasing Agency increased Corning, Ohio, crude oil 5 cents, making the new price 85 cents per barrel.

Effective November 3 the Rocky Mountain buyers increased Lost Soldier, Wyoming, crude 15 cents per barrel; Fort Collins, Colorado, 10 cents; Florence, Colorado, 15 cents; Wellington, Colorado, 10 cents; Dutton Creek, Wyoming, 15 cents; Rock Creek, Wyoming, 15 cents; Frannie light and Frannie heavy (Wyoming), 8 cents; Big Muddy, Wyoming, 15 cents; Grass Creek, Wyoming, 15 cents; Elk Basin, Wyoming, 15 cents; Hamilton Dome, Wyoming, 10 cents; Greybull, Wyoming, 15 cents; Pondera, Montana, 10 cents; Sunburst, Montana, 10 cents; Cat Creek, Montana, 15 cents, and Artesia, New Mexico, 15 cents.

Effective November 4 the Standard Oil Co. of Louisiana, followed by all other buyers, advanced the price of oil in North Louisiana and in El Dorado, Arkansas, 15 cents on each grade, and advanced Smackover, Arkansas, crude to 55 cents. The Gulf Refining Co. advanced East El Dorado crude to 55 cents.



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Petroleum Points the Way

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When depression came, oil was the last great basic industry to feel its effect. Leaders now agree that history will again repeat as the great sixteen billion dollar petroleum industry gives promise of taking the lead in business recovery.

Rapid strides have been made in the past two months.

Co-operation has supplanted cut-throat methods; sound reasoning and sober thinking are once again in command.

Already the rewards are apparent; compare the present condition with a short time ago. Then, unlimited and unnecessary production had forced the price level for crude below 20 cents; markets for refined products were seemingly bottomless.

Today, for the first time in history of the industry, production is stabilized on an orderly basis. Refining and marketing have been adjusted in keeping with demands, and the price level of both crude and refined products is on a higher scale, with the trend apparently upward.

Smiles of busy men are replacing scowls and frowns of idleness and despair. Courage and confidence are again overcoming doubt and fear. Petroleum, once again, is pointing the way to a business revival.

CONSUMPTION

The total consumption of crude oil and refined products for the first eight months of 1931 was within 2.7% of the consumption for the corresponding period of 1930—U. S. Bureau of Mines, report as of Sept. 1, 1931.

STORAGE

The oil industry in its producing, pipeline transportation and refining divisions has approximately 100,000,000 barrels of empty storage facilities—U. S. Bureau of Mines, report as of Sept. 1, 1931.

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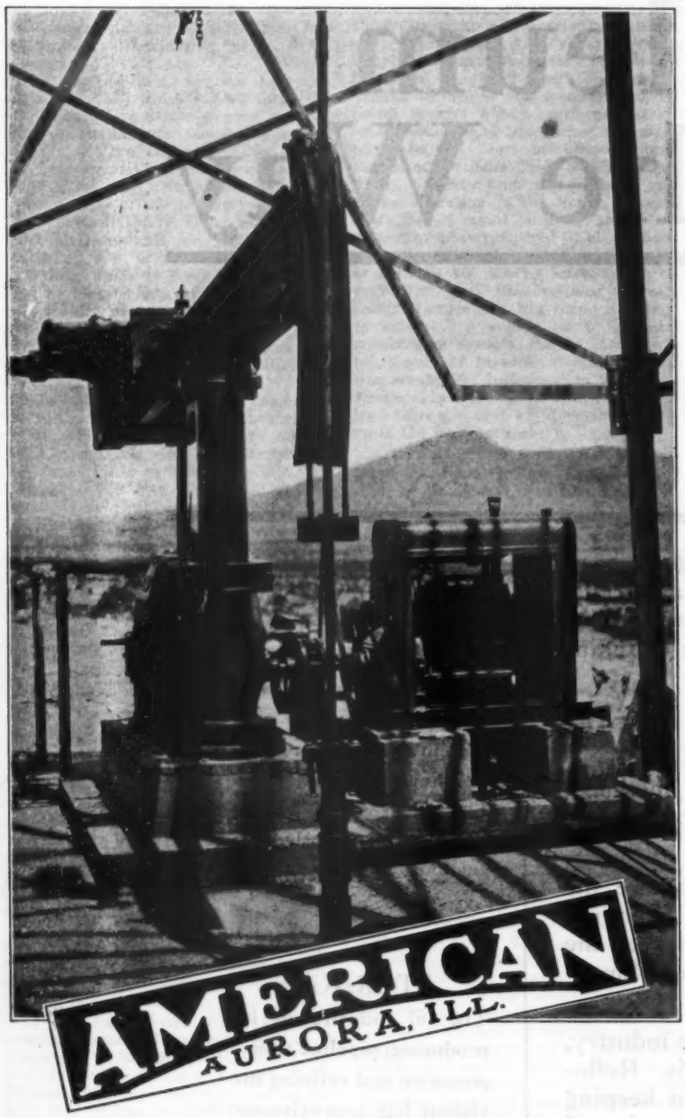

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CORROSION LOSSES SHOULD BE STUDIED

(Continued from Page 44)

vious that at greater depths the tubing would part under the direct tensile load of the weight of tubing and fluid. The magnitude of the "ultimate depth" is determined by:

A. **The size of tubing:** This determines the cross sectional area of steel which is available to support the load, the weight of the tubing string, and the volume of fluid.

B. **The size of sucker rods:** This, together with the inside diameter of the tubing, determines the volume of fluid.

C. **Specific gravity of the fluid:** This determines the weight of the fluid column.

D. **Ultimate tensile strength of the pipe material:**

Sizes of Tubings and Rods

Figure 1 is plotted for the following sizes of tubing and rods:

Size of tubing (inches)	Size of rods (inches)
2	⅝
2½	¾
3	⅞

and for fluid of specific gravity equal to 1.00. Variation in any of the above factors, excepting the ultimate tensile strength, will influence the slope of the line OB; the proportions of the rod and tube combinations for which this calculation is made are such that one line is equally representative of all three conditions.

The use of the diagram is illustrated by an example, the solution of which is shown in Figure 1. For a tubing string having a length equal to 60 per cent of its "ultimate depth," 1, the minimum stress, 2, is 46.6 per cent of the ultimate strength of the tubing material, while the maximum stress, 3, is 60 per cent of the ultimate strength of the tubing material. To determine if this range of stress variation is within the fatigue endurance limits of the material, a horizontal line is carried from 3 to 4. For a material subjected to a maximum stress equivalent to this value, the safe limit of stress variation is represented by the distance 4 to 5. In the case selected this safe range of stress variation is exactly equal to the range of stress variation to which the tubing is subjected, and it is concluded that for the conditions represented any string of tubing having a length greater than 60 per cent of the "ultimate depth" will be subject to fatigue failure, even in the absence of corrosion. There are two indeterminable factors which may readily increase the severity of the range of stress variations. The first of these is "water hammer" or "pound" due to lag in closing of the standing valve, which will impose an impact on the tubing due to the sudden checking of the flowing fluid. The second is lifting of the tubing by the sucker rods through pump cup friction.

Application of Principle

Application of the principle embodied in Figure 1 to the determination of corrosion losses is based upon the fact that in a tubing string which is within the safe endurance limit there should be no fatigue failures; hence, any failures which occur in such strings may be attributed to corrosion. Under corrosive conditions, the range of safe stress variation is reduced by approximately 50 per cent. For the conditions considered above, therefore, the safe depth under corrosive conditions would be only 30 per cent of the ultimate depth. For the tubing sizes used here, the safe depths under corrosive conditions are found by this calculation to be in the neighborhood of 3,000 feet. Field practice indicates that excessive breaks are obtained when using plain-end tubing at depths greater than this. In relation to the cost entailed by corrosion of tubing, it may be definitely stated that mechanical breakage of a tubing string, which is not long enough to be stressed beyond its endurance limit, is attributable to corrosion. The actual value of material lost, either by such

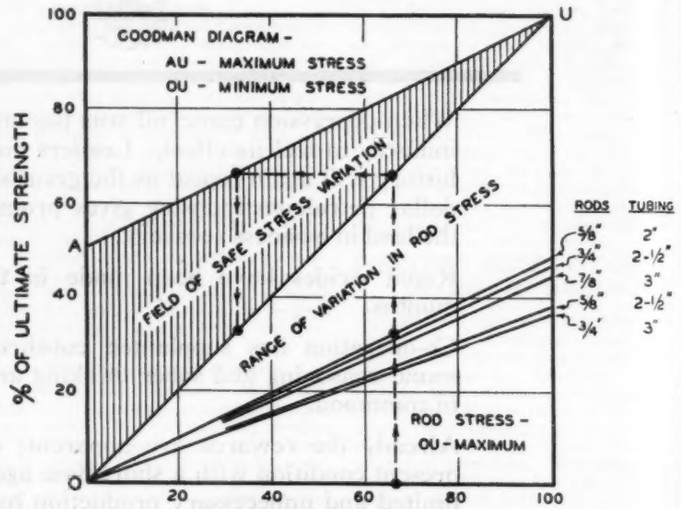

Figure 2. Fatigue stress in sucker rods.

DERIVATION OF FIGURE 2

The upper portion of Figure 2 is obtained exactly as is that of Figure 1. The value of AO is taken as 50 per cent of the ultimate tensile strength, assuming that the body of the rod, its smallest diameter, is the weakest section. This is justified by field experience. The special design of thread used on A.P.I. sucker rods eliminates the sharp bottom of the "V," reducing the stress concentration materially. With a sharp V-thread, such as was formerly used, the critical cross-section would be found at the base of the thread on the pins, and OA would be reduced to 12.5 per cent of the ultimate tensile strength of the steel. The data used in calculating the lower portion of the curve are given in Table 2.

TABLE 2
Specific Gravity = 1.00. Ultimate Tensile Strength = 100,000 Lbs. per Sq. In.

1. Size rods	⅝	¾	⅞	¾	⅝
2. Size tubing	2	2½	2½	3	3
3. Weight per foot rods—minimum load per foot	1.16	1.16	1.64	1.64	2.21
4. Weight per foot fluid	1.23	1.90	1.84	2.86	2.88
5. Maximum load per foot	2.39	3.06	3.48	4.50	5.01
6. Cross-sectional area of rods	0.307	0.307	0.442	0.442	0.601
7. Ultimate load	30,680	30,680	44,180	44,180	60,130
8. Ultimate depth	12,830	10,020	12,700	9,830	12,030
9. Rod weight load at ultimate depth	14,880	11,630	20,820	16,110	26,600
10. (9)÷(7)	0.485	0.379	0.472	0.364	0.443

The calculations are made exactly as in the case of tubing, and the ratios 10 used as limiting values for the minimum stresses at the "ultimate depth." The use of the figure is identical with that of Figure 1.

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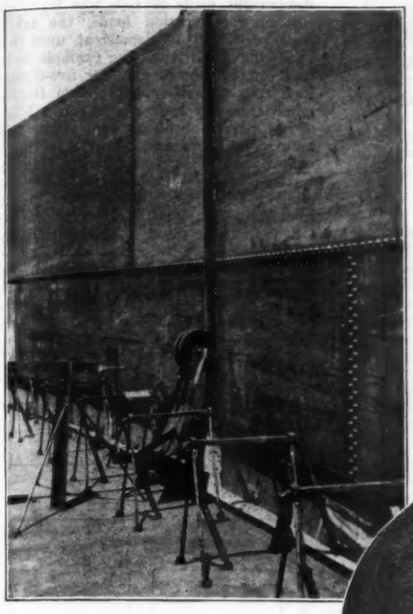

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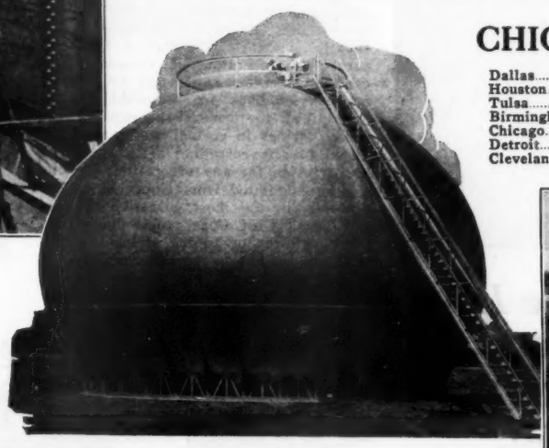
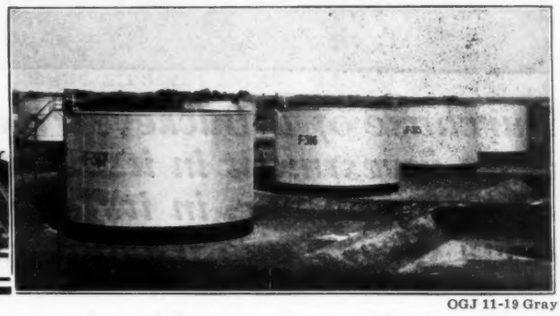
Above: Detail of the seal and guide mechanism on a Wiggins Pontoon Roof. At right: A Hortonspheroid and a group of Horton tanks with Wiggins Roofs.





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breakage or through destruction by corrosion, may be determined from the following formula:

(4) Actual loss of material equals initial cost of tubing times 1 minus age at time of failure divided by life of tubing not subjected to corrosion minus scrap recovery value.

For reasons outlined, the "life of tubing not subjected to corrosion" cannot be directly determined. An expedient for arriving at an approximation of this factor may be applied to fields which are of sufficient age to have produced failures of tubing strings which were not exposed to corrosive attack.

Wide Variation in Service Life

A study of well records of any such field will show a wide variation in the service life of tubing strings from different wells; but after elimination of cases definitely attributable to corrosion, accident, unusual operating conditions, improper selection of material, etc., it will be found that a large proportion of the remaining strings show a fairly uniform service life. Obviously, the range of life for these strings will depend upon the care taken in culling the records to discard cases where abnormal or subnormal service lives are indicated. Having determined the general average life of tubing strings in normal service not subjected to any corroding action, the loss by corrosion for any other tubing string can be calculated from Equation 4. For example, in the most corrosive field of the Texas Gulf Coast there have been many failures of tubing strings in less than one year, and more in from one to two years. Careful study of the records indicates that, in spite of this short life for most tubing, there are original tubing strings in service which have had no failures in 12 or 13 years. Hence, the life of tubing not subjected to corrosion is greater than 13 years. Where this expedient for the determination of "life of tubing not subjected to corrosion" can be applied, it is possible to determine the actual value of material lost through corrosion by the use of Formula 4. If this is not possible, an approximation may be obtained from:

(5) Actual loss of material equals initial cost of tubing minus scrap recovery value.

Sucker Rods

The determination of losses entailed by corrosion of sucker rods is based upon considerations identical to those which apply to tubing. Thus, the formula for determining the actual value of lost material becomes:

(6) Actual loss of material equals initial cost of rods times 1 minus age at time of failure divided by life of rods not subjected to corrosion minus scrap recovery value.

Determination of the "life of rods not subjected to corrosion" is subject to the same difficulties which were found to prevail in the case of tubing, complicated by the fact that it is necessary to pull rods to replace traveling valve balls and seats and pump cups, jobs which do not require that the tubing be pulled. Therefore, sucker rod threads are subjected to more frequent making and breaking than are those of the tubing in the same well. As in the case of tubing, it would be possible to estimate how many times sucker rods would have to be pulled if there were no corrosion. However, there are no data on the resistance of sucker rod threads to this type of wear. Hence, an expedient similar to that described for tubing must be resorted to in estimating the "life of rods not subjected to corrosion." Where the expedient cannot be applied, the following approximation is justifiable:

(7) Actual loss of material equals initial cost of rods minus scrap recovery value.

Sucker rods are subject to more severe fatigue stress conditions than is tubing, since the range of stress variation is far greater. On the downstroke the rods carry only their own weight, while on the upstroke the weight of the fluid column is added. This range of stress is still further increased by acceleration loads. The safe fatigue endurance range for sucker rods is shown in Figure 2, which is identical in form with Figure 1. This figure takes into consideration only the deadweight loads of rods and fluid, and neglects acceleration loads, the magnitude of which is dependent upon well operating conditions. The example solved in the figure shows that, for five-eighths-inch rods, 2-inch tubing, and a fluid of specific gravity 1, strings having a length of not more than 65 per cent of the "ultimate depth" are within the safe fatigue endurance range. In applying this criterion, considerable care must be exercised to evaluate the influence of corrosion in accelerating fatigue failure. Other factors which may materially reduce the endurance range are: Friction of rods against tubing, cup friction, impact loads, kinked rods, dirty or damaged threads, etc. By keeping these factors in mind, it is possible to determine

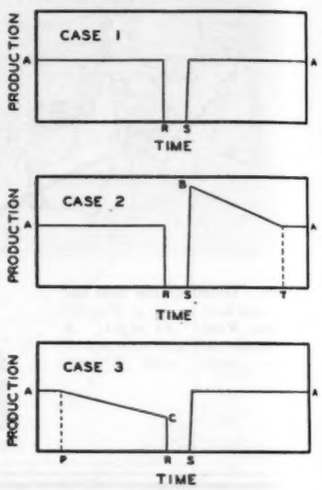

Figure 3.

what proportion of the mechanical breakage which is experienced in sucker rod strings may be attributed to the influence of corrosion fatigue, and to obtain data necessary for the application of Formulas 6 and 7.

Working Barrels

For working barrels it is improbable that any exact mathematical method could be established whereby the true life expectancy, in the complete absence of corrosion, might be established. This is evident when one considers that the mechanical wear on working barrels is influenced, to a greater or lesser extent, by:

a. Speed of pumping.
b. Type of pump cups.
c. Lubricating value of fluid.
d. Seal formed by fluid. This is a function of the gravity and viscosity.
e. Presence or absence of water.
f. Degree of emulsification, and type of emulsion formed.

The above list does not include all of the variables, but should be sufficient to demonstrate the hopelessness of attempts at direct evaluation. Hence, it is necessary to adopt an expedient similar to that used for tubing and rods. This involves a study of records of service life of working barrels in the field or territory under consideration. After eliminating cases of rapid failure, it will be found that a considerable proportion of the barrels has given approximately the same (maximum) service, and that there are only isolated instances of barrel lives greater than this figure. This service period can, therefore, be accepted as the life of a working barrel in the given field, if not subjected to corrosion, sand cutting, or other depreciating factors aside from normal wear. Application of this method is simplified, in the case of working barrels, by the fact that the life expectancy, even in the absence of corrosion, is comparatively short; hence, adequate data are readily obtainable. Once this factor has been obtained, the direct

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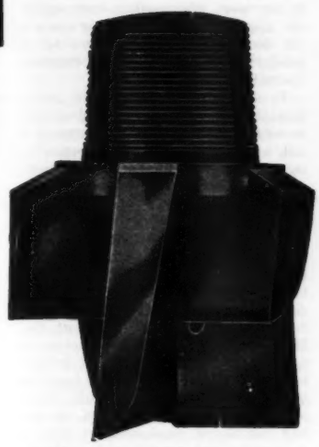
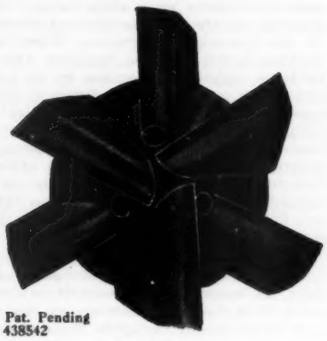


6 Blade Straight Hole Bit



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loss of working barrel material by corrosion may be computed from:

(8) Actual loss of material minus initial cost of barrel times 1 minus age at time of failure divided by life of barrels not exposed to corrosion minus scrap recovery value.

Since all factors in this equation are readily determinable, it should never be necessary to resort to an approximation.

There are two factors which must be very carefully considered in assigning a cause to failures of working barrels in a period shorter than the life expectancy in the absence of corrosion. First, a working barrel may be rendered absolutely worthless by corrosion to an extent which would be insignificant in the case of tubing or rods, since the slightest pitting of a barrel will result in excessive wear of cups. Second, premature failure may be caused by factors other than corrosion, among which may be recognized scoring by sand carried in the well fluid, and rapid wear of cups through changes in the plunger travel.

Balls and Seats

Because of the low cost of balls and seats, the losses of actual material which result from their corrosion are so slight as to be practically negligible. Since there is usually no scrap recovery value, the loss is equal to the initial cost. It would, of course, be possible to establish a normal depreciation rate for balls and seats, and thus compute the material losses more exactly; but the intrinsic value of the material is so small that the effort is not justified.

Although the material loss is insignificant, ball and seat failures contribute largely to indirect losses; and it is essential that corrosion failures be differentiated from mechanical failures, so that these indirect losses may be correctly apportioned. This is discussed in detail later.

Production Pipe Lines

With the exception of isolated cases of mechanical damage, flow lines, lead lines, and field lines are subject to no other form of deterioration than corrosion. For this reason, it is relatively simple to calculate the losses, keeping in mind the fact that such lines are normally laid of used pipe, so that the initial cost used should be that of second-hand pipe. The corrosion loss can be calculated from:

(9) Actual loss of material equals initial cost of pipe minus scrap recovery value.

Production Tanks

The service life of production tankage is limited only by the corrosion of the metal and by the mechanical damage incident to moving. As it is impossible to evaluate the latter factor, because of the many variables involved, the loss of value must be approximated as before:

(10 Actual loss of material equals initial cost of tank minus scrap recovery value.

Cost of Repairs

In addition to the actual loss of material described in the preceding section, each failure of production equipment necessitates certain costs to restore this equipment to its previous condition. Obviously, corrosion should be charged with its share of these costs of repair. In some cases, it will be apparent that corrosion is entirely responsible for the equipment failure, and the entire cost of repairs should be charged to corrosion. This is represented by corrosion puncture of tubing. In a majority of instances, the cost of repairs must be distributed between corrosion and normal depreciation, in accordance with the criterion established in the preceding section of this paper. For example, a fatigue failure in a string of sucker rods might be due to corrosion fatigue. Calculation established that 50 per cent of the normal service life of rods, under similar conditions, has been obtained. One-half the cost of repairs should be charged to corrosion and one-half to depreciation. A similar method for dividing the cost of repairs can be used, even where it is impossible to determine the exact cause of failure. Difficulties in segregating the cause of failure of working barrels have been described, and the method for charging the loss of material detailed. An identical method can be used to distribute the cost of repairs in any such cases where direct determination of the cause of failure is impossible.

Loss of Production

As is generally recognized, production lost through shutdown of wells is properly chargeable as a part of the cost of repairs. Considerations identical to those which were discussed in connection with the apportionment of repair costs govern the decision as to the percentage of lost production which must be considered as corrosion expense.

It should be pointed out that determination of the loss of production which is occasioned by shutting down a well is not a simple matter. The common practice of charging a prorata share of a well's normal daily production is, in most cases, entirely erroneous. Figure 3 represents types of production curves which have been frequently observed in actual practice, and which involve entirely different effects as concerns loss of production. Case 1 (Figure 3) is the simplest: A well, producing at the rate of A barrels per day, is shut down at the time R, and put back on production at the time S. The production rises immediately to rate A; hence, there has been lost the quantity of oil which would have been produced in the time R, S, if the well had continued producing at the rate A. A more usual condition is presented as Case 2. Here, when the well is put back on production at the time S, the production rate rises to a value B, higher than the rate A, which prevailed before the shutdown. From B, the rate gradually declines to the original rate A. In many cases of short shutdowns the total quantity of oil recovered under the conditions represented in Case 2 will be the same as would have resulted had there been no shutdown. Case 3 represents a very common field condition; resulting from cup wear, valve leaks, thread leaks or corrosion of tubing, etc. Production begins to decline from the initial rate A, at time P, and drops to a value C before the well is shut down for repairs. In actual experience the period P, R is usually found to extend over about three days. In Case 3, therefore, the loss of production is greater than that represented by the actual length of the shutdown. Combinations of Cases 1, 2, and 3 are, of course, commonly encountered.

The above discussion demonstrates the difficulty of determining the relationship between the shutdown periods and loss of production. From the practical standpoint, an evaluation of this loss of production can be arrived at only through actual gauging of individual wells over periods of several days before and after shutdowns of varying duration. If this is done, representative values can be arrived at for a given field or territory. These values will define, for the territory in question, the effect upon loss of production of:

a. Length of shutdown period.
b. Rate of fluid production.
c. Rock pressure of producing formation.

Thus, reasonably accurate estimates of loss of production can be made.

The importance of correct evaluation of loss of production as related to costs of corrosion merits careful consideration. This item should always be determined in any study of the economics of production corrosion. Its importance may be illustrated by the extreme case of corrosion of screen pipe in wells of the Texas Gulf Coast, where loss of production represents more than 50 per cent of the total loss entailed by the corrosion.

Indirect Increases in Production Cost

Any attempt to evaluate the losses entailed by corrosion of well equipment must necessarily, take into account the great increases in production expense which may result indirectly from damage of equipment by corrosion. Frequently these losses occur in fields where corrosion of equipment is not at all rapid; hence, are not generally charged against corrosion. It is difficult to determine the

magnitude of these indirect losses, but their importance must be recognized, since it has been found that substantial savings may be effected by their mitigation. Some of the more important sources of the indirect losses are the following:

Normally, failures of outside casing strings result from external corrosion at water strata. This permits water to enter the well, increasing the quantity of fluid to be lifted, accelerating corrosion of well equipment, and eventually flooding out the well. All of the increase in operating expense produced should be charged to corrosion. Likewise, any repairs necessary to maintain production should be treated as corrosion expense.

Where well equipment is subject to corrosion, it is necessary to pull rods and tubing frequently. The effect of the resultant wear on threads has been discussed previously, but is mentioned here since it is an indirect result of corrosion.

Corrosion causes abnormally rapid wear of pump cups by pitting and roughening of working barrels and also by the abrasive effect of products of corrosion obtained from tubing and sucker rods. The cost of the resultant pulling jobs should properly be charged to corrosion expense.

Fluid slippage in working barrels and balls and seats is produced by corrosion of these pump parts. The consequent lowering of pump efficiency increases the power consumption and cost.

Occasionally, corrosion fatigue or wasting of the metal causes parting of rods or tubing. Frequently this will necessitate a fishing job which should be charged as a corrosion loss.

It is a recognized fact that failure of pumping equipment to function perfectly results in increased formation of emulsions. When such failures are caused by corrosion, the extra treating expense should be considered a corrosion loss.

Water Flooding of Sands

Instances have been noted where productive formations have been flooded with water from overlying water strata. Most of these are in the older fields, and there is some question as to the actual cause of the water flooding. The condition may be due to corrosion puncture of the outside casing, or to imperfect casing seats. Records of the actual operations in setting the casing are usually lacking, so that it is impossible to determine exactly which cause is responsible for the trouble. If it could be established that corrosion of the casing is responsible for the water flooding, then all of the excess operating expense made necessary by the presence of water should be charged to corrosion.

Exact evaluation of the losses which arise from such water flooding is extremely difficult, particularly in fields where water, in addition to that leaking through or past the casing, is initially present in the formation. The only method for estimating the damages arising from such water flooding is through detailed study of production decline curves of wells in the area in question. From such studies it may be found that admission of the water has resulted in a sharp increase in the quantity of water produced by the field and in a concurrent reduction of the rate of oil production. Where this water flooding can be definitely and positively attributed to corrosion puncture of casing, all of the lost production can be charged as a corrosion expense.

Accelerated Decline in Production

Water flooding, which has just been considered, is an instance in which corrosion serves to accelerate the rate of decline of production. An even more striking example is afforded by the corrosion of oil well screen pipe in the fields of the Gulf Coast. The effect of this corrosion has been evaluated to a certain degree by comparison between groups of wells equipped with corrosion resistant screen pipe and groups of wells in which the screen pipe was subject to corrosion. This comparison has shown that the decline of production over a period of years is approximately 30 per cent more rapid in the wells in which corrosion of screen was experienced.

Where such an accelerated decline of production can be definitely attributed, in whole or in part, to the effects of corrosion, the consequent loss of production represents an economic loss which should be considered in evaluating the effects of corrosion.

Loss of Wells

In the foregoing discussion there have been mentioned several types of corrosion trouble which may, in extreme instances, result in the loss, as a productive unit, of a well before it has completely drained the surrounding sand. The following should be particularly noted in this connection:

A. Junking of wells due to mechanical failure of well equipment as a result of corrosion fatigue or wasting of metal.

B. Flooding of productive formation by water admitted through corrosion punctures in casing.

C. In specific relation to the Gulf Coastal fields, strainer corrosion is found to limit the ultimate recovery which can be obtained from a well.

The evaluation of corrosion losses of this type presents considerable difficulty, as it should be based upon the depreciated productive potentialities of the well, which can be determined only by thorough study of the decline characteristics of the area in question. The importance of such failures must not, however, be overlooked, as they serve in some areas to make necessary the drilling of a large number of wells in order to obtain complete recovery from a productive area.

Summary

Up to the present time there has been developed no uniform system whereby the magnitude of the economic losses arising from corrosion of production equipment can be determined. The need of such a system is demonstrated by the fact that one of the writers of this paper has endeavored, over a period of two years, to reconcile estimates made by members of the American Petroleum Institute subcommittee on production corrosion. Correlation is impossible, because a common basis for evaluation was not used.

The general principles which must be applied in evaluating losses resulting from corrosion of production equipment are discussed under the following headings:

A. **Direct loss of material:** It is shown that precise evaluation of loss of material by corrosion must be based upon the formula:

> Actual value of lost material equals initial cost of material times 1 minus age at time of failure divided by life expectancy in absence of corrosion minus scrap recovery value.

Methods for determining the numerical values of the various factors in this formula are detailed for the several classes of production equipment. Obviously, application of this method requires a tedious process of study of field records, but the unusual practice of basing estimates upon inadequate data has been found to lead to entirely erroneous conclusions.

B. **Cost of repairs:** The cost of repairs is an inseparable item in every case of corrosion failure, and should be calculated with the same care as the actual loss of material.

C. **Loss of production:** When a producing well is shut down, a loss of production may result. When the shutdown is occasioned by corrosion failure of any item of well equipment, this loss of production should be charged as a part of the corrosion expense. It is pointed out that such shutdowns do not necessarily result in loss of production, and that a correct evaluation can be reached only through study of well production curves.

D. **Indirect increase in production corrosion:** Probably the most neglected type of corrosion loss is that resulting indirectly from corrosion failure of equipment. These indirect losses are frequently important in fields where corrosion is not an obvious production trouble. Hence, careful study of field conditions is imperative to a proper summation of corrosion losses.

E. **Other sources of corrosion loss:** Corrosion of well equipment also results, in some instances, in water flooding of

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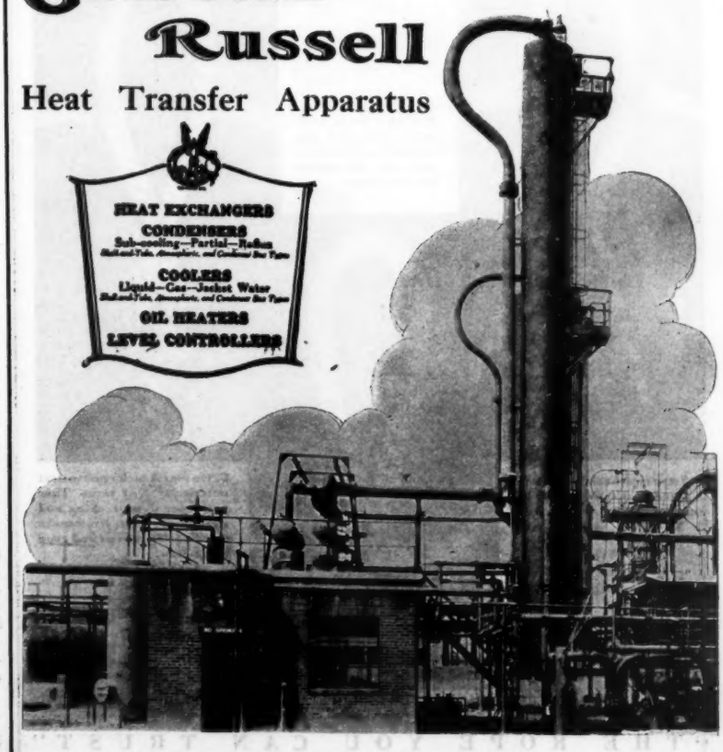

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producing formations, in an accelerated rate of production decline, and, for extreme cases, in the loss of producing wells before the economic limit of production has been attained.

The criteria laid down in this paper, if properly and intelligently applied, make possible an accurate evaluation of all of the items which enter into corrosion expense.

CAUSES OF PIPE LINE CORROSION SCANNED

(Continued from Page 41)

sources of stray current, and since the current became more regular after the ground dried out, it is assumed that the large variation was due to the increase in moisture content of the soil. The remaining 4 miles of this section showed five points of discharge and five reversals, and the current was fairly uniform.

The middle 5.3 miles section showed four reversals and four points of discharge, one of the latter being in the Caney River. Generally, the current flow was regular on this section. Where the current was discharging from the line, soil of low resistivity and relatively deeper pits was found.

TABLE 1—DESCRIPTION OF PIPE LINES
(Steel pipe, 8 inches, 28.5 pounds; wall thickness, 0.322 inches.)

Name—	Age	Miles	Joint	Coating	Measurements
Creek—Cherokee A	20	8.4	Screw	Thin paint	Resistivity
Creek—Cherokee B	10	4.5	Screw	Thin paint	Resistivity
Creek—Cherokee C	5	1.0	Screw	Heavy paint	Resistivity
Kay County	9	24.4	Welded	Asphalt	Resistivity and currents
Searight—Panova	6	9.3	Welded	Enamel	Resistivity
Lima—Searight	3	10.4	Welded	Enamel	Resistivity

Creek-Cherokee is one continuous line; Section B is a 4.5-mile extension to the original Section A; Section C is a replacement of part of the original line due to corrosion.

Although the long line current data are incomplete, the following observations appear warranted:

1. The magnitude and fluctuations of long line currents were greater than those observed by previous investigators. A maximum of over 6.85 amperes was observed in several places.

2. Long line currents are not constant, but may vary from time to time, due probably to moisture content of the soil, terrestrial magnetic currents, solar activity, and probably other causes.

3. The depth of pits seems to be dependent on the magnitude of the current. Taking into consideration the age of the pipe, eight years, and the low resistivities in many places, the pit depths were not large. However, an average of the current measurement showed about 0.5 amperes, which probably was not large enough to cause serious loss of metal.

4. Loss of current is not always indicative of serious pitting, unless concentrated at points of low resistivity. Conversely, when the line is picking up current, it cannot be definitely said that there will be no pitting. Pitting may occur along such stretches if there is sufficient leakage at points of low resistivity.

5. Long line current measurements furnish a rapid and inexpensive method of examining existing pipe lines to determine the portions that need reconditioning. Such measurements must, however, be supplemented with resistivity measurements.

6. In attempting to take measurements of long line currents on a pipe

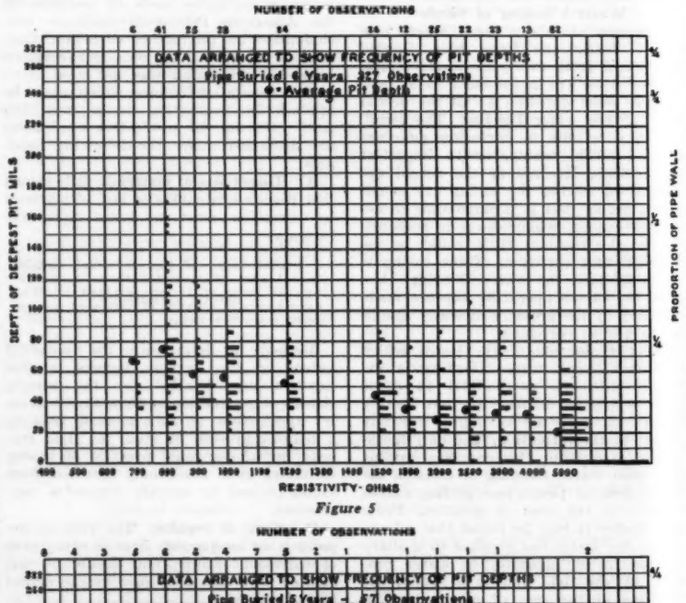

NUMBER OF OBSERVATIONS
DATA ARRANGED TO SHOW FREQUENCY OF PIT DEPTHS
Pipe Buried 6 Years 327 Observations
Average Pit Depth
DEPTH OF DEEPEST PIT - MILS
PROPORTION OF PIPE WALL
RESISTIVITY - OHMS

Figure 5

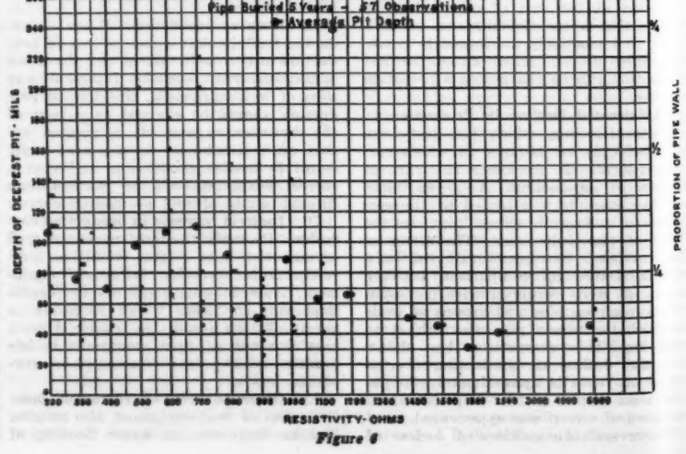

NUMBER OF OBSERVATIONS
DATA ARRANGED TO SHOW FREQUENCY OF PIT DEPTHS
Pipe Buried 6 Years - 327 Observations
Average Pit Depth
DEPTH OF DEEPEST PIT - MILS
PROPORTION OF PIPE WALL
RESISTIVITY - OHMS

Figure 6

line paralleling a telegraph line within a few feet, evidence of stray current of considerable magnitude was found.

Measurement of Soil Resistivity

The electrical resistivity of the soil was measured with Shepard's old style apparatus. This consists of two oak rods, 42 inches long, with a 3-volt dry cell mounted on one rod and a voltmeter on the other. The electrodes near the bottom are pieces of one-fourth inch brass pipe, five-sixteenth inch long. Shepard's improved design has a much larger cathode than anode contact to overcome the effect of polarization. The rods are thrust into holes in the ground 6 or more inches apart while the resistivity readings are being observed. The apparatus used was calibrated in a salt solution against Shepard's improved design, and the scale of the meter was graduated to read directly the resistance in ohms.

In using this apparatus it is necessary, in order to obtain accurate readings, to get good contact with the soil. In gravel or rocks it is impossible to obtain readings. Some of the difficulties encountered are listed below:

1. Great care must be taken to get good contact with the soil even under average conditions.
2. Soil may be too dry.
3. Soil may be too hard.
4. Rock may be too close to surface.
5. Sand and gravel make poor contact.

Where the soil was too dry to obtain good readings, a steel bar was used to make the holes, in which the rods were inserted. To make better contact water was poured into the holes. These holes had to be made carefully so that the bottom was not larger than the diameter of the electrodes.

Most of the observations were taken in the bottom of the ditch below pipe depth, where the soil usually was moist. Resistivity measurements were taken generally every 100 feet along the line; but where the pipe showed severe pitting or the resistivity varied, readings were often taken as close as 5 feet apart.

Observations on Soil Resistivity

1. It requires extreme care to obtain the resistivity, or even the relative resistivity, of the soil along a pipe line. An experienced observer is required for accurate measurements.
2. Shepard's apparatus is more useful to discover corrosive soil than the data presented indicate.
3. There is not much pitting in sand, gravel or rocks where it is impossible to measure resistivity with Shepard's apparatus.
4. Clays with extremely low resistance were always wet enough even in summer to obtain good resistivity measurements.
5. Where deep pits were found, soil of low resistance usually could be found at some depth.
6. Deep pits did not always coincide with soil of low resistance, but frequently were found in the next joint.
7. The resistivity of the soil below pipe depth is of some importance. Such observations sometimes discover soils of low resistance containing salts, which are absorbed by the top soil.
8. In soils of high resistance a hard rust scale sometimes forms, which seems to protect the pipe against further corrosion.
9. In soils of low resistance, where pitting is rapid, there is no scale or rust formation. The pipe is wet most of the time, and the corrosion products are white, yellow or green.

Measurement of Pit Depths

Pit depths were measured with a micrometer depth gauge having a 4-inch base and reading to 0.001 inch. Where soil and condition of pipe appeared to

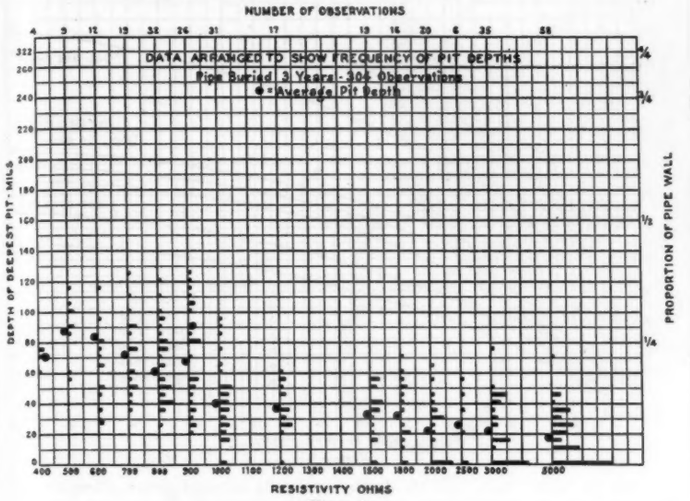

NUMBER OF OBSERVATIONS
DATA ARRANGED TO SHOW FREQUENCY OF PIT DEPTHS
Pipe Buried 3 Years - 304 Observations
* = Average Pit Depth
DEPTH OF DEEPEST PIT - MILS
PROPORTION OF PIPE WALL
RESISTIVITY OHMS

Figure 7

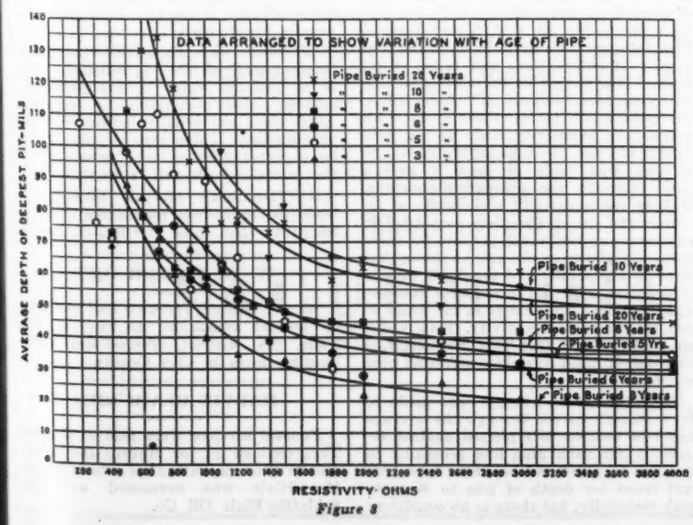
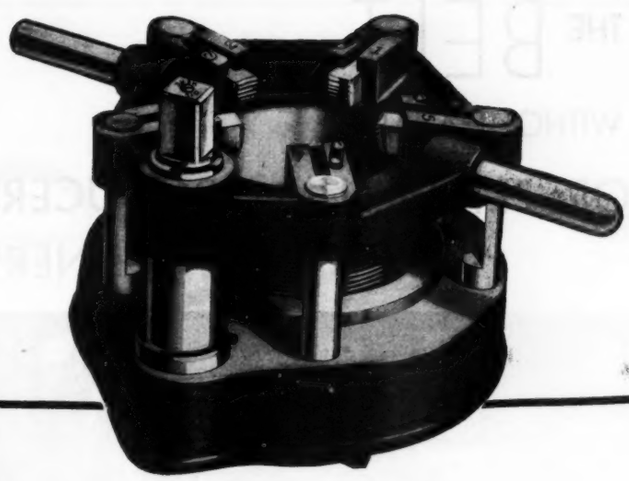

DATA ARRANGED TO SHOW VARIATION WITH AGE OF PIPE
Pipe Buried 20 Years
Pipe Buried 10 Years
Pipe Buried 8 Years
Pipe Buried 6 Years
Pipe Buried 5 Yrs.
Pipe Buried 3 Years
AVERAGE DEPTH OF DEEPEST PIT - MILS
PROPORTION OF PIPE WALL
RESISTIVITY OHMS

Figure 8



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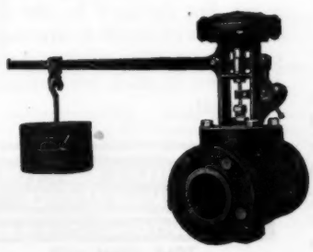

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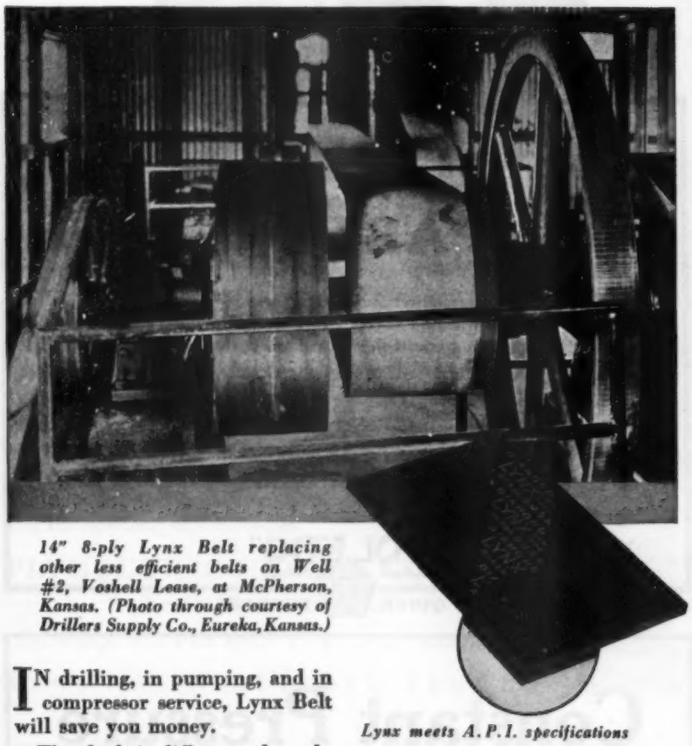

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be uniform, pits were measured every fifth joint, or about 100 feet apart; otherwise every joint was examined. It was necessary, of course, to measure several pits in order to discover the deepest. The adjustment of the gauge was checked frequently.

On the lines coated with enamel a cleaning machine could not be used, so a portion of the coating had to be scraped off with spades, knives, and wire brushes in order to inspect the pipe. The deepest pits were not difficult to find, as they usually occurred where the enamel had failed on the bottom of the pipe. Pits were dug out with a knife, and the depth measured from the original pipe surface. If the nature of the corrosion was such that it was difficult to measure from the pipe surface, or if the pipe was covered with a thick uniform rust scale, no measurements were taken.

The effect of the protective coating in retarding or accelerating the depth of pits is uncertain.

Table 2 shows the number, magnitude, and range of pit depths.

Presentation and Discussion of Resistivity Data

The complete data observed have been plotted on long rolls of profile paper, but, as stated above, have not been reproduced for publication.

Figures 2, 3, 4, 5, 6 and 7 show a summary of the relation between the depth of deepest pit and soil resistivity for pipe lines buried 20, 10, 8, 6, 5 and 3 years. The data are also arranged to show frequency of observations and range of pit depths. The length of the horizontal line indicates the number of observations. The solid circle indicates the average pit depth. The resistivity scale is not uniform; and for the sake of clearness, no attempt was made to draw a smooth curve through the average pit depths. Making the resistivity scale uniform increases the size of the plate considerably, and serves no particular purpose for these graphs. A glance at the graphs shows that there is a general trend for depth of pits to decrease with the increase in resistivity. There is a wide range in the depth of pits for the same resistivity. This is due no doubt to the fact that resistivity is only one of many variables affecting pipe corrosion.

In Figure 8 an attempt was made to draw smooth curves through the average depth of deepest pits plotted against resistivity for each pipe line according to its age. As noted before, there is a general trend for depth of pits to decrease with resistivity, but there is no consistent relationship between the pipe lines according to age. The 5 and 8-year curves cross, and the 10-year curve lies above the 20-year.

In Figure 9 the relationship between the average depth of deepest pits and age of pipe is shown for soils of different resistivities. The points are pretty well scattered and inconsistent, in places, so that fitting the curves to the points depends pretty much on the judgment of the individual plotting the data. This figure does, however, show quite definitely that the rate of pitting decreases with age, which at the present time is quite a generally accepted theory. The rate seems to be greatest in the first few years.

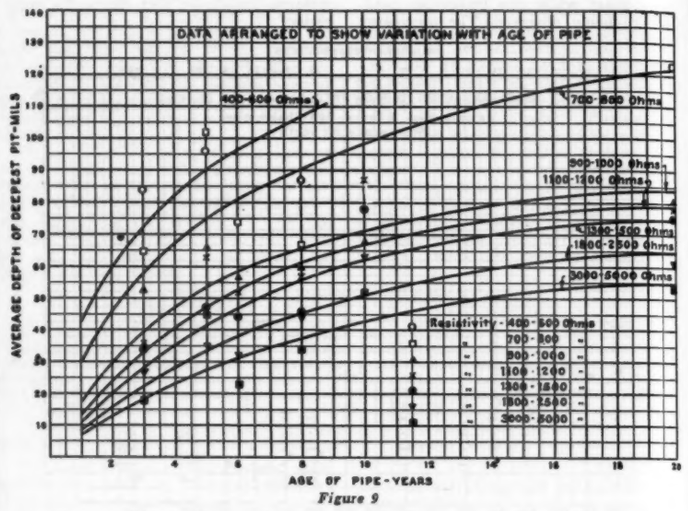

Figure 9

Conclusions

The data which have been presented indicate many variations and irregularities. This may be due largely to trying to analyze one variable, such as soil resistivity, when several are involved in the determination of soil corrosivity. Errors in observation must also be considered. No definite conclusions can, therefore, be drawn until more data are available. However, taking into consideration these limitations, the authors have concluded tentatively that:

1. There is some correlation between long line currents and corrosion. In general, galvanic currents gradually accumulate on pipe lines through soils of high resistance, and in most cases discharge from the lines in soils of low resistance. If current density is relatively high and the discharge is abrupt, deep pitting is usually experienced.

2. There is considerable correlation between depth of pits and resistivity. This is of practical value in soil corrosivity surveys. Soil resistivities of less than 1,000 ohms are usually indicative of severe pitting. If due care is used, it may be expected that a large percentage of the corrosive soils will be located.

3. The result of this investigation leads to conclusions that agree closer to Shepard's than those of Gill and Rogers.

TABLE 2—PIT DEPTH MEASUREMENTS

Name—	Age	Miles	No. of measurements	Maximum pit	Average pit	Pits over 0.100 No.	Pits over 0.100 Per cent	Pits under 0.050 No.	Pits under 0.050 Per cent
Creek—Cherokee A ...	20	11.4	432	0.322	0.074	65	15.0	128	29.6
Creek—Cherokee B ...	10	4.5	150	0.235	0.065	17	11.3	46	30.6
Kay County	8	24.4	963	0.322	0.053	43	4.5	488	50.7
Searight—Panova	6	9.3	327	0.130	0.041	15	4.6	210	64.0
Creek—Cherokee C ...	5	1.0	57	0.220	0.084	14	24.6	14	24.6
Lima—Searight	3	10.4	301	0.190	0.041	14	4.6	195	65.0

W. W. FRASER DIES

W. W. Fraser, operator and executive of several companies in the Wichita Falls, Tex., district, dropped dead while hunting doves in Clay County.

MARVIN BLAIR DIES

Funeral services were held at Electra, Tex., October 31 for Marvin Blair, who died in Wichita Falls after a brief illness. Mr. Blair was connected with the Schlaffke-Blair Oil Co.

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2. Repair costs averaged $36 per month. No repairs necessary in 3½ months with Gargoyle D.T.E. Oil Heavy.
3. Gargoyle D.T.E. Oil Heavy actually cost 19.4% less per month than the oil formerly used.

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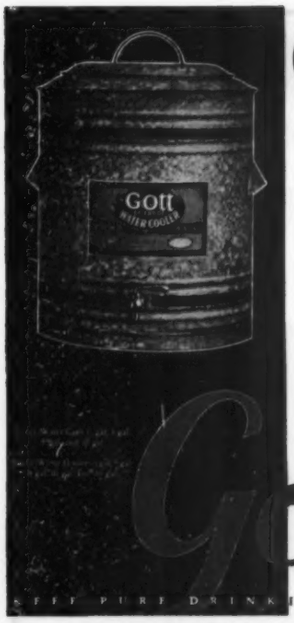

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CENTRAL WEST FIELDS

(Continued from Page 67)

Sheahan 100 acres, in the W half SW Section 20, has a gas volume of 2,250,000 feet.

In southeastern Michigan, G. E. LeVeque's No. 1 H. Randall farm, Section 4, Sumpter Township, Wayne County, came in a failure. It was drilled for the shallow gas sand found in that area and not far removed from a good well on the Ray Straight farm, at a depth of 104 feet.

Muskegon

Oil operators in the Muskegon Field, which was opened about four years ago as the second commercial field in Michigan, are still receiving more than $1,000 a day for oil and gas, says the Chronicle.

"An average daily production of 1,500 bbls. of oil and 1,000,000 feet of gas has been maintained since January 1, 1931. At oil and gas prices which have averaged 60 cents a barrel and 15 cents a thousand feet an approximate income of $315,000 has been received during the year to date. Present oil and gas production is about 50 per cent lower than it was at the beginning of the year. The daily flow of oil has dropped from 2,000 to about 1,000 bbls. a day, while gas production has fallen from 2,000,000 to 1,000,000 feet. More than 200 of the 475 wells have been drilled in the field since the discovery well was brought in December 15, 1927, by the Muskegon Oil Corp. With a daily production of about 1,000 bbls. the wells still average about 5 bbls. each. Some wells are still making from 30 to 50 bbls. a day, while others are shut down much of the time. Comparatively high prices for oil have been maintained in the fields because of the demands of three operating refineries, namely: the Old Dutch Refining Co., the Naph-Sol Refining Co. and the Henry H. Cross Co.

"While other Michigan producers have been receiving only 55 cents a barrel Muskegon operators are now receiving 73 cents a barrel. Each refinery is served by a separate pipe line. At present the daily production of about 1,000 bbls. is divided as follows: Old Dutch, 400; Naph-Sol, 400, and Cross 200 bbls.

"The Old Dutch Co. is also running from 1,500 to 2,000 bbls. a day of crude oil shipped to Muskegon from the Mount Pleasant Field by rail. Laying of a $250,000 pipe line to Muskegon is being considered by John Borden, head of the Old Dutch Co."

Gas Distribution

The major portion of the gas marketed from the field during the past 10 months has been handled by the West Michigan Consumers Co. This company has maintained a daily average of about 800,000 feet with a monthly sendout varying from 16,000,000 to 30,000,000 feet.

The Continental Motors Corp, and the Muskegon Pipe Line Co. are other pipe line operators who have accounted for the 200,000 feet a day. During the summer months industrial gas consumption has been considerably less than the potential daily production of the field. It is still about 50 per cent less than potential, said J. L. Robinson, manager of the West Michigan Co., but is gradually increasing. As the general industrial load increases boiler use of gas will be reduced. The West Michigan Co. pays 12 and 15 cents per 1,000 feet for gas, while other purchasers pay as high as 20 cents. This accounts for the average of 15 cents.

Potential daily production of the field now ranges between 1,500,000 and 1,750,000 feet, depending upon the condition of the operating wells. Sulphur content is removed from all gas handled by the West Michigan Co. There is a little sulphur in Upper Traverse or Monroe gas, however, so the other companies experience little trouble. Most of the sulphur comes from the Dundee formation.

With an average of $150 a day for gas and $7,300 a day for oil, producers expect to receive about $52,000 more before the close of the year for a total of about $367,000.

Field Pickups

Two years ago a well was started by the Hesperia Petroleum Co., on the Walter Jones farm, NE SE Section 20, Denver Township, Newyago County, and drilled to a depth of 2,300 feet, or between the Upper and Lower Traverse formation. Edward Hesse, of Lakeside, and Henry W. Carpenter, a driller, are moving in a rig to deepen it from 2,300 feet at least to the Dundee formation.

Drilling Permits

The Department of Conservation of Michigan issued two drilling permits during the past week. J. A. McKay, Detroit, Mich., got a permit to drill No. 8 well 450 feet from the north line and 750 feet from the east line of the James S. Bicknell farm, No. 2 in the NW SE NW Section 6, Grant Township, Clare County.

A permit for drilling was also given the Mammoth Oil Co. to John C. Arthurs of Mount Pleasant, to drill No. 1 on the Julius and Caroline Schug farm, NE S half SW Section 22, Vernon Township, Isabella County, location being 330 feet from the north line and 360 feet from the east line of the farm.

LEGAL

Call for Bids to Purchase Royalty Oil Accruing to the United States from the Salt Creek, Wyoming, oil field. Pursuant to the provisions of Section 36 of the act approved February 25, 1920 (41 Stat., 437), sealed proposals, in duplicate, will be received in the office of the Secretary of the Interior, Washington, D. C., on or before noon on December 1, 1931, from responsible bidders for the purchase, for a period beginning January 1, 1932, of all royalty oil accruing to the United States from Government lands in the Salt Creek, Wyoming, oil field. For the calendar year 1930 the total Government royalty oil from Salt Creek field amounted to approximately 1,325,000 barrels, and for the period from January 1 to July 31, 1931, to approximately 656,000 barrels, about 14 per cent of the production of the field, the average gravity in both years being in the range from 36.0 to 36.9 degrees A. P. I. Additional information may be obtained from the Director, Geological Survey, Department of the Interior, Washington, D. C., or the Supervisor, Geological Survey, Casper, Wyoming. Bids are invited on three separate items as follows: Item 1. Royalty oil for the period beginning January 1, 1932, and ending December 31, 1932. Item 2. Royalty oil for the period beginning January 1, 1932, and ending December 31, 1934. Item 3. Royalty oil for the period beginning January 1, 1932, and ending December 31, 1936. Bids must be in the following form: "For the period beginning January 1, 1932, and ending December 31, 193... (name of bidder), offers ..... cents per barrel above the highest field price for oil of equal or lower gravity in Oklahoma and Kansas, and/or in Wyoming, whichever is the higher, as published or offered by any responsible recognized purchaser for crude oil in quantity not less than 2,000 barrels a day." Delivery of royalty oil will be made in the field without cost to the Government to the successful bidder or for his account. Payments for the royalty oil are to be made to the Register of the United States Land Office, Cheyenne, Wyoming, on or before the fifteenth day of each month following that in which delivery is made. The quantity and quality of the oil will be determined by tank measurement and suitable tests, the measured quantity will be corrected for impurities in excess of one-half of one per cent, and the volume computed in terms of standard barrels at 60° F. Each bidder must submit with his bid a bond in the sum of $1,000 or a certified check payable to the order of the Secretary of the Interior in the sum of $1,000 as a guarantee that he will, if successful, promptly execute a satisfactory contract and furnish a bond in the sum of at least $250,000, conditioned upon full and complete compliance with the terms of the contract. The Secretary of the Interior may accept the offer of the highest bidder and/or bidders and reserves the right to reject all bids whenever within his judgment the interest of the United States demands. Storage facilities are available on Naval Petroleum Reserve No. 3, Wyoming (Teapot), for approximately 1,500,000 barrels of oil. Information in regard thereto may be obtained from the Secretary of the Navy. Sealed bids are to be submitted to the Secretary, Department of the Interior, Washington, D. C., the envelope to be marked plainly "Bid on Salt Creek royalty oil." No bid received after the time herein fixed for submitting bids will be considered. Ray Lyman Wilbur, Secretary of the Interior. October 21, 1931. (P. N. 57694)

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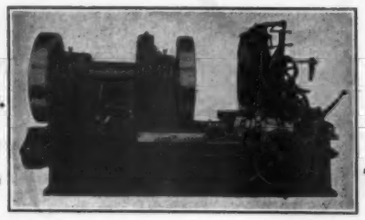

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Tax Collections On Gasoline Show 4.5 Per Cent Gain

WASHINGTON, D. C., Nov. 7.—The grand total tax of motor fuel for the United States for the first half year of 1931 was $248,372,635 from the sale of 7,117,874,233 gallons of gasoline, this being an increase of 4.5 per cent in gallonage over the same period of 1930 according to a report just released by the Bureau of Roads.

In addition to this revenue automobile and other motor car licenses collected by all of the states aggregated $1,625,782 making a grand total of collections from all sources $246,372,635 for the six months period.

The average gasoline tax rate for 1931 was 3.44 cents per gallon.

During this period there were eight increases of the tax rate, Arizona going to 5 cents a gallon; Arkansas, 6 cents; Massachusetts, 3 cents; North Carolina, 6 cents; Oklahoma, 5 cents; Utah, 4 cents; Washington, 5 cents and Wisconsin 4 cents.

Nevada showed the largest rate of increase in the consumption of gasoline over the same period of 1930; this increase being 21 per cent; Pennsylvania followed with an increase of 18.6 per cent; California, 14 per cent; Wyoming, 12.5 per cent; Indiana, 12.3 per cent; Maine, 11.1 per cent; Oregon, 10.8 per cent; Minnesota, 10.3 per cent; Missouri, 8.3 per cent; Texas, 7.7 per cent; Washington, 7.5 per cent; Rhode Island, 7.3 per cent.

Decreases in gasoline (motor) consumption were led by Kansas which dropped 18.8 per cent with North Carolina close second at 17.9 per cent; Mississippi third or 17.7 per cent decrease; Oklahoma, 13.1 per cent decrease; Alabama, 6.5 per cent decrease; and Arkansas 6.3 per cent decrease. Georgia and Idaho each decreased 1 per cent.

Expenses incurred in collecting this gasoline tax aggregates $823,415.

Of the total amount of the gasoline tax expended, $158,332,132 went to construction and maintenance of state highways; $48,416,879 for local roads; $18,860,172 for state and county road bond payments; $10,156,541 for city streets and $9,783,496 for miscellaneous purposes which included $7,406,416 for schools; $321,890 for suspense and reserve accounts; $756,241 in Oklahoma for special relief fund; in New York for New York City general funds $687,400; in New Jersey for inland waterways $45,000; in Mississippi for financing sea wall to protect road $106,290.

New York State expense for collecting its tax on 695,642,265 gallons of gasoline at the rate of 2 cents per gallon tax, was $142,199, while the cost of collection in California for collecting the tax of 3 cents on 617,035,384 gallons was $38,898.

WELL AND REFINING MACHINERY EXPORTS

WASHINGTON, D. C., Nov. 7.—The grand total of United States exports of industrial machinery during August, 1931, was valued at $9,926,408, of which $290,481 was for oil well and refinery machinery.

In August, 1930, the grand total was $15,147,495, of which $1,602,583 was for oil well and refinery machinery.

The July, 1931, exports of oil well and refinery machinery were valued at $1,430,016.

The exports of oil well and refinery machinery in August, 1931, were distributed to the several principal importing countries as follows: Argentina, $48,902; British India, $44,671; Soviet Russia in Europe, $44,342; Germany, $34,030; Colombia, $26,129; Rumania, $17,890; Mexico, $17,434; Venezuela, $12,042; Canada, $10,507; British Malaya, $3,606; France, $3,318; Greece, $2,646; Trinidad and Tobago, $2,469; Union of South Africa, $1,813; United Kingdom, $1,585; Australia, $1,150.—C. E. K.

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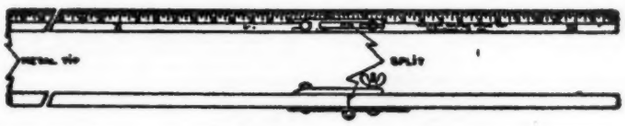

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Oklahoma-Kansas and Eastern Pipe Line Report

OKLAHOMA-KANSAS

Pipe Line Statement for August

Runs

	Month (bbls.)	Dy. av. (bbls.)
Prairie P. L. Co.*	530,100	17,100
Gulf P. L. Co.	1,184,912	38,223
Texas P. L. Co.	424,977	13,709
Magnolia P. L. Co.	1,376,696	44,407
Empire P. L. Co.	1,303,455	42,047
Cosden P. L. Co.	584,860	18,866
Stanolind P. L. Co.*	1,556,200	50,200
Oklahoma P. L. Co.	1,987,099	64,100
Other lines	4,050,119	130,649
Total August	13,029,328	419,301
Total July	19,562,548	631,081
Difference	6,534,220	211,780

Shipments

Prairie P. L. Co.	3,413,618	110,117
Gulf P. L. Co.	1,621,578	52,309
Texas P. L. Co.	768,064	24,776
Magnolia P. L. Co.	1,312,642	42,343
Empire P. L. Co.	2,041,516	65,865
Cosden P. L. Co.	724,574	23,373
Stanolind P. L. Co.	3,672,415	118,465
Oklahoma P. L. Co.	2,957,638	95,408
Other lines*	6,758,000	218,000
Total August	23,270,345	750,656
Total July	23,149,033	746,742
Difference	121,312	3,913

Stocks

Prairie O. & G. Co.*	36,523,000
Gulf P. L. and Gypsy Oil Co.	8,658,769
The Texas Company	3,430,631
Magnolia Petroleum Co.	6,649,208
Empire P. L. Co.	4,082,255
Mid-Continent Petroleum Corp.	3,494,511
Stanolind Crude Oil Pur. Co.*	16,831,600
Oklahoma P. L. Co.	1,202,189
Carter Oil Co.	7,889,875
Other lines*	16,624,839
Total August	105,427,880
Total July	111,096,680
Difference	5,668,800

*Estimated.

EASTERN PIPE LINE REPORT FOR MONTH OF SEPTEMBER

Runs from Wells

In the following table will be found the regular receipts from wells by various pipe lines in New York, Pennsylvania, West Virginia, Ohio, Kentucky, Illinois, Indiana and Michigan for August and September:

	Aug., 1931	Sept., 1931
Nat Trantist	121,756.52	145,864.04
S W Pa. P. L.	64,160.09	79,823.98
Eureka P. L.	274,238.96	306,199.28
Buckeye P. L. (Macksburg)	225,597.43	277,205.53
Buckeye P. L. (Cleveland)	11,149.05	12,190.61
Buckeye P. L. (Lima, etc.)	70,669.93	82,263.82
Indiana P. L.	2,600.03	2,703.99
Cumberland P. L.	146,239.07	145,866.70
N. Y. Transit	26,817.39	30,392.22
Tidewater P. L.	23,868.07	22,802.35
Pure Oil	217,524.86	292,400.07
Stoll Oil Ref.	55,043.70	29,470.48
Bradford Transit	363,931.05	415,169.77
Total	1,596,596.16	1,840,352.84
Daily average	51,503.10	61,345.09

Petroleum Deliveries

The following tables exhibit the shipments or regular deliveries of the various pipe lines in New York, Pennsylvania, West Virginia, Ohio, Kentucky and Indiana for August and September:

	Aug., 1931	Sept., 1931
Nat. Transit	572,837.36	499,112.79
S W Pa P. L.	470,477.88	423,403.26
Eureka P. L.	403,173.50	372,988.75
Buckeye P. L. (Macksburg)	209,652.58	234,573.66
Buckeye P. L. (Cleveland)	2,191.00	1,944.16
Buckeye P. L. (Lima, etc.)	1,965,006.60	1,803,206.78
Indiana P. L.	1,146,141.55	909,359.87
Cumberland P. L.	97,247.87	115,316.63
Southern P. L.	67,327.53	70,722.76
N. Y. Transit	184,459.52	171,412.21
Northern P. L.	194,193.95	255,413.44
Tidewater P. L.	557,863.79	465,676.21
Pure Oil	233,792.38	222,738.09
Bradford Transit	365,531.21	480,695.64
Tuscarora	479,254.08	500,545.93
Total	6,949,150.80	6,526,110.18
Daily average	224,166.16	217,537.01

Gross Stocks

The gross stocks held by various pipe lines in the oil-producing sections of New York, Pennsylvania, West Virginia, Ohio, Indiana and Kentucky at the close of August and September:

	Aug., 1931	Sept., 1931
Nat. Transit	709,462.64	749,274.20
S W Pa. P. L.	437,987.33	404,189.10
Eureka P. L.	1,604,026.45	1,445,855.17
Buckeye P. L. (Macksburg)	304,905.35	347,122.33
Buckeye P. L. (Cleveland)	41,579.11	39,616.26
Buckeye P. L. (Lima, etc.)	2,982,405.14	2,778,403.92
Indiana P. L.	507,328.32	523,814.43
Cumberland P. L.	621,498.00	69,282.55
Southern P. L.	206,524.98	219,384.72
N. Y. Transit	117,899.23	108,612.34
Northern P. L.	247,413.61	208,028.03
Tidewater P. L.	862,114.87	924,216.84
Pure Oil	410,582.85	485,055.55
Tuscarora	12,283.66	11,544.91
Bradford Transit	126,446.26	178,031.09
Total	9,192,457.33	8,492,431.43
Decrease	377,392.45	700,025.90

Grades of Oil

The following table shows the amount of the different grades of oil held by the Eastern pipe lines at the close of August and September, showing gross stocks of the above fields:

	Aug., 1931	Sept., 1931
Pennsylvania	3,104,338.44	3,054,494.51
Lima	711,235.85	664,893.87
Kentucky	632,038.36	79,690.06
Mid-Continent	3,343,664.94	4,202,724.97
Illinois	.....	15,643.58
Michigan	401,179.74	474,984.44
Total	9,192,457.33	8,492,984.44

Daily Average Runs

The following table shows the daily average runs of the Pennsylvania, Lima and Kentucky oil fields for the past four years:

	1928	1929	1930	1931
January	52,904	51,749	75,907	53,939
February	57,002	51,833	79,256	55,163
March	57,485	54,252	76,688	54,331
April	56,812	58,444	84,536	54,914
May	62,067	59,902	70,546	53,344
June	58,230	58,833	75,430	54,110
July	57,144	66,087	68,921	50,723
August	57,745	66,087	54,291	51,502
September	53,487	67,315	56,595	61,345
October	58,100	76,093	58,179	.....
November	53,865	74,831	52,332	.....
December	52,025	74,561	53,999	.....

Daily Average Shipments

The following table gives daily average shipments from the Pennsylvania, Lima and other fields for the past four years:

	1928	1929	1930	1931
January	146,465	165,721	217,623	175,369
February	167,368	159,387	224,355	183,494
March	158,883	161,474	228,846	189,508
April	172,935	169,737	241,845	191,450
May	180,559	184,281	248,383	199,247
June	188,024	185,404	234,401	221,155
July	189,470	194,763	207,094	211,632
August	192,853	194,946	205,506	224,166
September	194,138	201,214	193,999	217,537
October	176,000	191,367	157,675	.....
November	176,898	202,743	146,638	.....
December	173,572	186,257	143,001	.....

Gross Stocks

In the following table will be found the gross stocks of the various lines of the Pennsylvania, Lima and Kentucky oil fields, including oil received from other lines at the close of each month for the past three years:

	1929	1930	1931
January	7,596,564	12,229,045	11,831,09
February	8,738,835	12,091,961	11,506,48
March	9,002,058	13,247,217	[illegible]
April	8,978,172	13,233,961	[illegible]
May	8,903,560	13,052,953	10,728,22
June	8,921,275	13,398,855	9,903,34
July	8,211,565	13,268,562	9,569,84
August	9,440,643	13,047,051	9,192,45
September	9,443,067	12,812,018	8,492,43
October	9,441,101	12,427,555	.....
November	9,868,538	11,851,380	.....
December	11,253,953	11,751,952	.....

The Illinois Field

The following table gives the report of the Illinois Pipe Line Co. in Illinois:

	Bbls.
Gross stocks, Oct. 1	545,397,7
Runs from wells	469,381,4
Other receipts	72,044,8
Regular deliveries	300,486,3
Other deliveries	223,151,7

The amount of Illinois oil run by the Tidewater Pipe Line Co. in September was 22,802.35 bbls. Deliveries were 22,526.21 bbls. Adding these figures to those of the Illinois Pipe Line Co. makes the runs and deliveries as follows:

	Runs	Deliveries
1931—		
September	492,183.83	323,012.1
1930—		
January	543,387.95	498,293.3
February	548,416.33	414,536.3
March	631,944.49	469,119.
April	530,074.22	509,304.
May	605,147.37	504,069.
June	572,662.57	468,658.
July	604,529.54	388,454.
August	594,642.12	375,742.
September	457,001.11	371,691.
October	478,442.12	320,688.
November	422,794.63	355,403.
December	556,418.73	363,719.
1931—		
January	468,429.04	669,573.
February	429,284.54	461,262.
March	424,638.23	356,663.
April	421,814.98	282,532.
May	433,231.80	322,513.
June	510,805.78	320,258.
July	520,009.33	289,219.
August	476,622.86	393,231.

Tidewater Pipe Co., Ltd., also delivered in September 124,993.66 bbls. of Oklahoma oil.

AVERAGE DAILY RECEIPTS OF CALIFORNIA CRUDE AND REFINED OIL AT ATLANTIC AND GULF PORTS

Average barrels per day in 1930-31—	ATLANTIC PORTS						GULF COAST PORTS					
	Baltimore	Boston	New York	Philadelphia	Others	Total	Galveston	New Orleans, Baton Rouge	Port Arthur Sabine Pass	Tampa	Total	Tot all po
September	6,300	6,400	25,600	13,400	9,567	61,267	.....	.....	.....	.....	2,433	63,7
October	2,516	3,065	27,258	16,419	4,903	54,161	.....	.....	.....	.....	5,355	59,5
November	3,367	6,333	33,800	17,733	4,800	70,733	.....	.....	.....	.....	4,800	75,5
December	5,516	4,323	30,645	9,678	3,580	53,742	.....	.....	.....	.....	4,645	58,3
January	3,387	6,613	21,968	14,678	11,096	57,742	.....	.....	.....	.....	6,129	63,8
February	5,787	2,713	29,143	4,000	5,750	47,393	.....	.....	.....	.....	3,750	51,1
March	10,033	1,611	21,388	7,324	8,774	49,129	.....	.....	.....	.....	6,355	55,4
April	5,133	.....	19,200	16,500	10,067	50,900	.....	.....	.....	.....	4,000	54,9
May	4,452	2,064	19,903	11,226	6,258	44,903	.....	.....	.....	.....	3,355	47,2
June	4,367	.....	25,100	6,333	3,500	39,200	.....	.....	.....	.....	.....	39,2
July	6,774	1,194	24,612	11,065	9,902	53,548	.....	.....	.....	.....	1,335	54,8
August	3,452	.....	16,419	7,419	4,290	31,580	.....	.....	.....	.....	968	32,5

AVERAGE DAILY IMPORTS OF CRUDE AND REFINED OIL AT PRINCIPAL UNITED STATES PORTS

Average barrels per day in 1930-31—	ATLANTIC PORTS						GULF COAST PORTS					
	Baltimore	Boston	New York	Philadelphia	Others	Total	Galveston	New Orleans, Baton Rouge	Port Arthur Sabine Pass	Tampa	Total	Tot all po
September	38,867	8,533	150,933	34,600	25,567	258,400	6,433	12,234	.....	3,800	22,467	280,8
October	19,839	11,742	146,194	35,355	26,967	240,097	6,065	7,067	2,774	3,545	18,451	258,5
November	39,633	35,900	124,633	36,467	24,667	261,300	3,467	7,366	.....	1,767	11,600	272,9
December	21,419	14,033	122,774	32,839	33,774	224,839	6,290	10,613	3,097	290	19,290	244,1
January	17,613	13,519	154,225	32,902	30,613	248,871	3,032	11,677	3,097	3,097	18,903	267,7
February	31,321	16,929	137,786	31,714	26,857	234,607	4,536	11,571	.....	536	16,643	251,2
March	37,645	18,935	141,160	26,290	21,129	235,161	4,065	2,580	.....	1,968	8,613	243,7
April	35,000	10,533	105,000	29,767	35,533	215,833	3,733	3,400	.....	.....	6,133	221,9
May	36,129	8,774	107,000	25,452	26,710	198,065	.....	2,000	.....	.....	2,000	200,0
June	36,067	10,833	111,767	27,000	20,833	206,500	3,300	5,500	2,167	1,833	12,300	218,8
July	36,387	11,226	104,678	29,323	21,775	193,387	6,903	7,419	4,194	.....	18,516	211,9
August	32,613	15,581	91,742	22,387	25,741	188,064	4,161	2,516	.....	3,162	9,839	197,9

GROSS PRODUCTION OF CRUDE OIL IN THE UNITED STATES FOR 12 MONTHS

(In Barrels of 42 Gallons)

		California	Oklahoma	Texas	Kansas	Arkansas	Louisiana	Rocky Mts.	Eastern	Tot
1930—										
September:	Month	17,984,306	16,509,120	23,111,822	3,405,510	1,583,280	2,008,060	3,239,010	3,396,000	71,237,
	Daily average	599,477	550,304	770,394	113,517	52,776	66,935	107,967	113,200	2,374
October:	Month	18,244,053	16,632,523	23,626,553	3,517,913	1,636,552	2,142,885	3,225,550	3,627,000	72,707,
	Daily average	588,518	536,533	762,147	113,223	52,792	69,125	104,050	117,000	2,345
November:	Month	18,109,459	14,941,770	22,035,222	3,459,230	1,557,576	2,136,948	3,257,100	3,322,000	68,419
	Daily average	603,648	498,059	734,507	115,311	51,919	71,231	98,570	107,400	2,280
December:	Month	17,786,728	15,067,105	21,810,359	3,432,661	1,590,951	2,187,534	3,118,663	3,328,000	68,231
	Daily average	573,766	485,713	703,560	110,731	51,321	69,598	100,602	107,355	2,200
1931—										
January:	Month	16,485,738	14,850,953	20,019,312	3,422,475	1,574,955	2,135,037	2,966,142	3,374,000	64,828
	Daily average	531,798	479,063	645,781	110,725	50,805	68,872	95,683	108,839	2,091
February:	Month	14,930,932	13,531,986	18,957,571	3,241,016	1,402,492	1,981,616	2,747,924	3,129,000	60,021
	Daily average	533,248	483,285	677,057	119,222	50,089	70,772	98,108	111,750	2,143
March:	Month	16,364,842	16,627,687	22,463,619	3,498,593	1,469,345	2,061,576	3,398,035	3,374,000	68,747
	Daily average	527,898	536,377	724,310	112,858	47,395	66,502	96,485	108,839	2,217
April:	Month	15,803,541	16,815,990	26,887,717	3,281,880	1,412,230	2,008,021	3,901,370	3,273,000	72,384
	Daily average	526,785	559,255	896,257	109,396	47,074	66,934	96,729	109,100	2,413
May:	Month	16,448,960	17,333,867	28,705,684	3,241,366	1,446,274	2,232,568	3,098,419	3,190,000	76,309
	Daily average	530,612	559,157	926,086	107,786	46,654	72,018	99,949	102,900	2,446
June:	Month	15,641,436	16,678,200	29,139,833	3,175,440	1,344,450	1,850,511	2,986,200	3,166,000	73,982
	Daily average	521,381	555,940	971,327	105,848	44,815	61,684	99,540	105,533	2,466
July:	Month	16,093,322	16,467,789	33,827,313	3,090,762	1,287,430	1,715,730	2,905,909	3,241,000	78,739
	Daily average	519,139	531,219	1,091,200	99,702	41,530	55,345	93,739	107,774	2,539
August:	Month	15,668,584	9,875,510	32,279,816	3,148,887	1,165,445	1,584,444	2,807,143	3,167,000	69,500
	Daily average	505,451	312,210	1,041,284	101,577	37,595	51,111	90,553	102,161	2,243
Total 12 months		199,562,301	185,135,492	302,857,621	40,179,838	17,471,164	24,014,930	35,851,065	39,587,000	844,649
Daily average		546,746	507,193	829,747	110,082	47,868	65,794	98,222	108,458	2,314